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ADULTERATION

OF

FOOD, DRINK, AND DRUGS.

BEING THE

Evidence taken before the Parliamentary Committee.

ARRANGED AND SIMPLIFIED,
WITH A COMPREHENSIVE INDEX.

182

BIBLIOTHECA · BODLEIANA

LONDON:
DAVID BRYCE, 38, PATERNOSTER ROW.

1855.

268. c. 204.

PRINTED BY TAYLOR AND GREENING,
GRAYSTOKE-PLACE, FETTER-LANE.

PREFACE.

THE importance of the subject which the Select Committee, presided over by Mr. Scholefield, was appointed to investigate, obviates the necessity for any apology for publishing in full the evidence taken before it. We say in full, because, though it is presented in the following pages in a somewhat condensed form, not a single fact is omitted, and the whole is given in the words of the witnesses. Those who have attended the sittings of a Parliamentary Committee, or taken the trouble to wade through the interminable pages of one of the voluminous Blue Books, in which the results of such inquiries are embodied, know how often the same question is repeated, how many verbal iterations occur in the answers, and what time and space are often occupied in mere explanations of matters which are readily understood when in type. In preparing this work for publication, all these redundancies have been carefully pruned away, and the reader has the whole of the evidence presented in a connected form, divested of everything that adds nothing to its completeness or its interest, and revised throughout in the most careful manner. The subject of adulteration is one which concerns so closely every member of the community, that such a book, embodying the opinions of some of the most eminent chemists and medical men of the day, and giving in detail the process and the ingredients used in every known sophistication, whether of our food, our beverages, or our medicines, together with the means whereby they may be detected, in every case in which the resources of science have yet supplied us with them, will be invaluable in every household, as long as the dishonest and pernicious practices that led to the inquiry presided over by Mr. Scholefield shall remain a stigma upon the trading classes of this country. A carefully prepared Index is given, which will enable any article to be readily found, with the evidence relating to it, without the trouble of searching for it all through the volume. The value of the book for reference is thus greatly increased, as every reader is enabled to see at once all that concerns him most, whether as a seller or a consumer.

LIST OF THE COMMITTEE.

MR. SCHOLEFIELD, Chairman.

Mr. C. VILLIERS.
LORD CLAUD HAMILTON.
VISCOUNT GODERICH.
Mr. KNIGHT.
Mr. SHERIDAN.
Mr. PEACOCKE.
VISCOUNT EBRINGTON.
Mr. ALDERMAN CUBITT.
Mr. KINNAIRD.
Mr. OTWAY.
Mr. SWIFT.
Mr. GREGSON.
Mr. WISE.
Mr. MOFFATT.

REPORT.

The Select Committee appointed to inquire into the Adulteration of Food, Drinks, and Drugs, and who were empowered to report their observations to the House, have made further progress in the matters to them referred, and have agreed to the following Report:—

That they have taken evidence on the subject referred to them, but have found themselves unable to complete the inquiry within the time at their disposal.

They confine themselves, therefore, to reporting to the House the evidence already brought before them, with a recommendation that the investigation be renewed in the ensuing Session of Parliament.

August 8th, 1855.

LIST OF WITNESSES.

	Page
ARTHUR HILL HASSALL, M.D.	1
ROBERT WARRINGTON, Esq.	48
ALPHONSE NORMANDY, M.D.	56, 163, 276
JOHN SIMON, Esq.	86
Sir JOHN GORDON	94
JOHN MITCHELL, Esq.	102
ROBERT DUNDAS THOMPSON, M.D., F.R.S.	108
Mr. THOMAS BLACKWELL	125
THEOPHILUS REDWOOD, Esq.	128
Mr. THOMAS HERRING	165
PETER L. SIMMONDS, Esq.	173
JOHN POSTGATE, Esq.	188, 232
CHARLES H. BURTON, Esq.	194
GEORGE PHILLIPS, Esq.	194
RICHARD ARCHER WALLINGTON, Esq.	218
HENRY LETHEBY, M.D.	242
MAURICE SCANLAN, Esq.	254

ADULTERATION OF FOOD, DRINKS, AND DRUGS.

FRIDAY, JULY 13TH, 1855.

EVIDENCE OF ARTHUR HILL HASSALL, M.D.

I AM a Doctor of Medicine of the University of London, and a Member of the College of Physicians of London. I have devoted a great deal of attention to the consideration of questions of adulteration, not only of articles of food and drink, but of drugs and other things. It prevails in nearly all articles which it is worth while to adulterate, whether food, drink, or drugs. The majority of adulterations consist in the addition of substances of greatly inferior nature, for the sake of weight and bulk. Others consist in the addition of various colouring matters, to conceal other adulterations, or to heighten, and, as it is considered, to improve the appearance. Lastly, a few adulterations are for the purpose of imparting smell, pungency, or taste. I propose to give evidence, first, to show the fact of adulteration and its prevalence. Secondly, to treat of the sanitary bearings of the question. Thirdly, to show the importance of the microscope as a means of discovering adulterations; and fourthly, to suggest remedies for their suppression.

I will read three lists I have prepared. First, of various substances which have been ascertained by myself to be employed for different purposes of adulteration. Second, a list of articles ascertained by others to be used. The third, a list of articles stated to be so employed, but of the use of which no positive evidence has been adduced; although it is extremely probable that many of those substances are occasionally had recourse to. The following is a classified list of the articles analysed, and the various substances ascertained by myself to be employed for different purposes of adulteration.

Annatto is adulterated with chalk, wheat flour, rye flour, salt, and soap, for bulk and weight; for colour it is adulterated with turmeric, a ferruginous earth (probably Venetian red), and red lead. *Arrowroot*, with sago, potato, and tapioca starches, and various mixtures and combinations of these with the inferior arrowroots. *Anchovies* are mixed with Dutch, French, and Sicilian fish, and sometimes those fish are passed off as the anchovy itself; bole Armenian and Venetian red are also added to colour the liquid which surrounds the fish. *Bread* is adulterated with mashed potatoes, alum, hards, and sometimes, though rarely, with sulphate of copper. *Butter*, with water. *Bottled fruits* and *vegetables*, with certain salts of copper, usually the acetate. *Cinnamon*, with cassia; and most of the articles to be mentioned under spices. *Coloured confectionery*, with East India arrowroot, wheat and potato flour, hydrated sulphate of lime; and is coloured with cochineal, lake, indigo, Prussian blue, Antwerp blue, artificial ultramarine, carbonate of copper or verditer, carbonate of lead or white lead, red lead, vermilion, chrome yellow, or chromates of lead, lemon, orange, and deep gamboge, the three Brunswick greens, emerald green or arsenite of copper, Indian red, brown ferruginous earths, chiefly umber, Sienna, and Vandyke brown, and various combinations of the above pigments, and also bronze powders. *Coffee*, with chicory, roasted wheat, rye and potato flours, roasted beans, mangel-wurzel, and a substance resembling acorns. *Chicory*, with roasted wheat and rye flours, burnt beans, mahogany sawdust, carrot, mangel-wurzel; and coloured with ferruginous earths, as Venetian red, and umber, and burnt sugar, sometimes denominated black-jack. *Cocoa* and *chocolate*, with Maranta, East India, and Tacca or Tahiti arrowroots, tous-les-mois, the flours of wheat, Indian corn, sago, potato, and tapioca, and various mixtures of these, sugar, and chicory; and coloured with Venetian red, red ochre, and other ferruginous earths. *Cayenne pepper*, with ground rice, mustard husk, deal sawdust, salt; coloured with red lead and vermilion, or bisulphuret of mercury, Venetian red, and turmeric. *Custard* and *egg powders* contain wheat, potato, and rice flours, coloured with chrome yellow, or chromate of lead, and turmeric. *Curry powder*, with ground rice and potato farina, and salt; coloured with red lead. *Flour*, with alum. *Ginger*, with wheat, sago, and potato flours; coloured with turmeric powder. *Gin*, with water, sugar, cayenne, cassia, or cinnamon, and flavourings of different kinds; and for fining, alum and salt of tartar. *Rum*, with water and cayenne pepper. *Isinglass*, with gelatine. *Lard*, with potato flour, water, salt, carbonate of soda, and caustic lime. *Mustard*, with wheat flour and turmeric. *Milk*, with water and annatto. *Marmalade*, with pulp of apple or turnip. *Oatmeal*, with barley flour, and the integuments of barley, called rubble. *Porter* and *stout*, with water, sugar, treacle, and salt. *Pickles*, with salts of copper, usually the acetate of copper. *Potted meats* and *fish*, with flour, probably wheat flour boiled, coloured with bole Armenian, and sometimes Venetian red. *Preserves*, with salts of copper, including the acetate. *Pepper*, with wheat and pea flour, ground rice, ground mustard seeds, linseed meal, p. d., or pepper dust. *Snuff*, with the chromates of potash, chromate of lead, ferruginous earths, chiefly umbers, red and yellow ochre, red lead or oxide of lead, the chromates of potash, carbonate of ammonia, lime, powdered glass or silex, and powdered orris root. In *sugar*, wheat flour was found in two cases only; it is but rarely adulterated; potato flour and tapioca starch were each found in one case. *Cinnamon* is adulterated with cassia, wheat flour, sago, meal, and mixtures of these, East India arrowroot, and potato flour. *Pimento*, with mustard husks in one instance. *Mixed spice*, with wheat, sago, and potato flours, ground rice, and two vegetable substances, one of which resembled linseed. *Sauces*, such as the *essence of anchovies*, *lobsters*, and *shrimps*, and *tomato sauce*, with red ferruginous earths, as bole Armenian and Venetian red. *Tea*, with exhausted tea leaves, leaves other than those of tea, British and foreign; among the former, those of sycamore, horse-chesnut, and plum; with lie tea, paddy husk, sand, and starch: coloured with plumbago or blacklead, gum, indigo, Prussian blue, turmeric, Chinese yellow, China clay, and soap-stone or French chalk; and it is flavoured with sulphate of iron, catechu gum, la veno beno, and Chinese botanical powder. *Tobacco,* with water, sugar, treacle, and salts of various kinds. *Vinegar,* with water, burnt sugar, and sulphuric acid. *Jalap,* with powdered wood of two different kinds. *Ipecacuanha,* with chalk, wheat flour, powdered woods, and other vegetable substances. *Opium,* with poppy capsules, wheat flour, sugar, gum, powdered wood, and sand. *Scammony,* with wheat flour, chalk, resins of guaiacum and jalap, sand, and woody fibre.

This list does not embrace nearly all the substances employed in adulteration; it contains those only which have actually been discovered by myself in the several articles subjected to analysis up to this time. Many of these are not simply adulterations of an innocuous character, but are many of them injurious to health, and some of them even poisonous. I have detected those adulterations partly by the microscope, partly by chemistry; the great proportion by the microscope, where they have consisted in the addition of any vegetable substance, or any other substance having size or structure sufficient to characterise it. This is a somewhat novel application of the microscope; indeed it was not known that the microscope might be so generally applicable to the subject of adulteration as it proves to be. I state the fact of these adulterations with confidence; I have no doubt of the accuracy of the tests applied. The results have been published from time to time, in connexion with the names of the parties from whom the different articles were purchased; if, therefore, there had been any general inaccuracy in the results, it cannot be questioned that some of those parties would have shewn the error in the statements made regularly during four years, andinvolving the publication of the names and addresses of many hundreds of manufacturers and traders.

The method pursued was this. Two persons, in whom confidence could be reposed, purchased the articles. Immediately on each purchase the name and address of the party was placed on the wrapper, with date and initials of the persons purchasing.

Feeling the great responsibility resting upon myself, in order to insure accuracy, nearly always I accompanied the purchaser, and saw that there could be no mistake or error committed. Usually 20, or 30, or 40 samples of the same article were subjected to examination before any report was drawn up upon them. Very seldom the statement as to any substance rests upon the examination of one sample. All the shops of one particular kind, on one side of the street, were visited first, and on returning up the street the shops on the other side were taken. Samples were not selected for any special purpose, but from different traders in the town, in an impartial manner. In some instances, traders were selected of all classes purposely, in order to test the extent to which adulteration prevailed. The most respectable traders were often taken who dealt in certain articles, and then those living in more frequented and populous parts of the City. No information was given to the traders of the purposes for which I required the articles. The purchase was made in the ordinary way, by simply asking for the articles I desired to be furnished with.

The next list is one of articles ascertained by others to be used for the purpose of adulteration. This has been compiled partly from examination of different works and papers published on adulteration of different articles of food, and partly from proceedings which have been reported of the Excise from time to time.

Bread has been ascertained to be adulterated with sulphate of copper. *Coloured sugar confectionery*, with sap green. *Flour*, with mineral white, or hydrated sulphate of lime. There have been several cases recently reported in the newspapers, of adulteration of flour by millers with that substance. *Gin* is adulterated with grains of paradise, sulphuric acid; various gin flavourings, containing coriander seeds, angelica root, calamus root, almond cake, orris root, cardamom seeds, orange peel, and grey and white salts. *Lard* is adulterated with mutton suet, alum, and potash; *milk* and *cream* with flour or starch, and treacle; *porter* and *ale* with cocculus indicus, grains of paradise, capsicum, ginger, quassia, wormwood, calamus root, caraway and coriander seeds, ginger, orange powder, liquorice, honey, sulphate of iron, sulphuric acid, cream of tartar, alum, carbonate of potash, oyster shells, hartshorn shavings, fabia amara, or nux vomica, and beans for fining. In *snuff* there is quassia, gentian, and Colombo root, peat, moss, earthy matter, rhubarb leaves, leaves of trees, and fustic wood. *Tea* is mixed with the leaves of beech, plane, bastard plane, elm, poplar, willow, fancy oak, hawthorn, and sloe, and coloured with rose pink, Dutch pink, vegetable red and yellow dyes, chrome yellow, Venetian red, carbonate of copper, arsenite of copper, chromate and bi-chromate of potash, and carbonates of lime and magnesia. *Tobacco* with rhubarb, potato, coltsfoot, dock, and other British leaves, sawdust, malt comings, earthy matter, sand, and nitrate of soda.

The third list is the articles stated by others to be employed for different purposes of adulteration, but of the use of which no positive evidence has been adduced, although it is extremely probable that many of them have been or are occasionally had recourse to. In *arrowroot*, ground rice; in *anchovies*, sprats; in *bread*, barley, oat, rye, Indian corn, bean and pea flours, potato starch, pipeclay, plaster of Paris, and bone-dust. In *coloured confectionery*, white potters' clay, pipeclay, or Cornish clay, chalk, plaster of Paris, and sand, coloured with cobalt, smalt, and ultramarine. In *coffee*, roasted peas, coffee grounds, and parsnip, coloured with madder root. In *chicory*, torrified ground rice, roasted biscuit, oak bark tan, exhausted tan called croats, baked horses' liver, burnt blood, litmus, and Naples yellow. In *cocoa* and *chocolate*, cocoa-shells, old sea biscuits, coarse branny flour, animal fats, as tallow or lard, treacle, sulphate of lime, and chalk. *Flour*, with rye, Indian corn, rice, bean and pea flours, potato starch, chalk, bone earth, plaster of Paris, and powdered flints. In *gin* there is acetate of lead. In *litmus*, common arsenic and peroxide of mercury. In *mustard*, pea flour, linseed meal, and radish seeds. In *milk*, sheep's brains and chalk. In *pepper*, ground oilcake and clay. In *raspberry jelly* and *currant jelly*, orris root. In *sugar*, sand and plaster of Paris. In *sauces*, chalk, plaster of Paris, and red lead. In *tobacco*, the leaves of cabbage, sea-weed, roasted chicory root, bran and oakum, liquorice, beet-root dregs, fuller's earth, sal ammoniac, carbonate of ammonia, nitrate of ammonia, salt, alkalies, as potash and soda, catechu or terra japonica, and opium. In *vinegar*, acetic, pyroligneous, hydrochloric, nitric, and tartaric acids, cayenne, long pepper, mustard seeds and salt.

The tables consist of a mere enumeration of articles analysed and substances found in them; they do not convey any idea of the frequency with which the several articles are employed. I will now proceed to that branch of the subject.

With respect to *coffee*, the microscopical examinations of the first series of samples of *ground coffee* subjected to analysis were as follow:—That 34 coffees, with three exceptions, were adulterated; chicory present in 31 instances; roasted corn in 12; beans and potato flour each in one case; in 16 cases the adulteration consisted of chicory only; in the remaining 15 samples the adulteration consisted of chicory, and either roasted corn, beans, or potato flour; in many instances the quantity of coffee present was very small; and in others not less than one-fifth, fourth, third, half, and so on, of the whole article. From a second series of samples the conclusions were, that 18 out of the 20 samples were adulterated with chicory, and four samples contained roasted corn in addition to chicory. From another series of examinations, out of the 42 samples of coffee submitted to analysis 11 were unadulterated; the remaining 31 were all adulterated with chicory, which was met with in every proportion, in many cases constituting the chief part of the article; in two cases only was any other adulteration than that with chicory observed; one consisting of a vegetable substance resembling horse-chestnut, and the other of some amorphous substance, probably used for colouring. This examination was, at the commencement of the investigations, published in *The Lancet* four years ago. In an examination of *canister coffee*, the whole of the 29 packages, bottles, and canisters of coffee submitted to analysis, with a single exception, were adulterated: in 28 of the samples the adulteration consisted of chicory, in many instances constituting the chief part of the article: five of the coffees contained roasted wheat-farina, and substances bearing a close resemblance to mangel-wurzel and acorn. In another series of analyses at a later period, out of the 20 samples 19 were adulterated with chicory: several of the samples on incineration left a coloured residue from the presence of red oxide of iron, derived from some red ferruginous earth, as Venetian red, employed in the adulteration of the chicory contained in the coffee. From an examination of 34 samples of coffee purchased shortly after the recent regulation authorising the sale of mixed chicory and coffee in labelled packages, out of the 34 samples all purchased as coffee, only three were genuine, while no less than 31 contained various proportions of chicory; in six of the samples chicory was present in the proportion of about one-third of the article; in 22 of the samples chicory formed about one-half of the article; three of the samples consisted almost entirely of chicory; 13 were not labelled "Mixture of chicory and coffee," and yet 10 of these were adulterated with chicory; the remaining 21 samples, notwithstanding that coffee was distinctly asked for in each instance, were labelled "Mixture of chicory and coffee." In 34 samples of *ground coffee*, purchased a few days subsequently at the same establishments from which the previous 34 samples were procured, all purchased as coffee, nine were genuine, while no less than 25 contained various proportions of chicory; in eight chicory was present in the proportion of about one-third of the article; in 14 chicory formed about one-half of the article; three consisted almost entirely of chicory; two were not labelled "Mixture of chicory and coffee," and yet were adulterated with chicory, the parties (the adulteration being brought home to them) being liable in each case to a fine of 100*l.* Of the 25 samples containing chicory, notwithstanding that coffee was distinctly asked for in each case, 23 were labelled "Mixture of chicory and coffee."

Contrasting these two tables of analyses, it appears, therefore, as consequences of the previous report, that greater caution is now observed in the sale of mixed chicory and coffee without a label, an offence punishable by a fine of £100; also that a larger proportion of dealers sell the genuine article when asked for it, but that the "mixture" is still palmed off as extensively as ever upon the public as coffee. In 10 additional samples purchased as coffee, two were sold as coffee, being labelled "Mixture of chicory and coffee;" one was sold as a mixture of chicory and coffee, which it really was; and seven were genuine.

I now come to *sugar* and its adulterations. In 36 samples of *brown sugar*, fragments of cane, frequently so minute as to be visible only with the microscope, were detected in all the sugars except one very white sugar, evidently purified by filtration, so as to cause it to approach in character refined or lump sugar; the disgusting insects acari were present in 35 out of the 36 sugars, and in 19 cases in very considerable numbers; sporules and filaments of fungi were present in at least 10 cases; grape sugar in the whole 36 sugars, often in very considerable amount; the whole of the sugars contained a variable proportion of vegetable albumen; a greater or less number of pieces of woody fibre in nearly all the sugars; stony particles or grit in at least 11 instances; a variable quantity of starch or flour in each sample, either in granules or aggregations of granules and cells; in four of the sugars the amount of flour was so considerable that it had evidently been employed for the purpose of adulteration. In 15 samples of *lump sugar* there were no fragments of cane, these having been separated by the filtration through charcoal to which sugar in process of refinement is subjected; in no case were acari observed; in three only were traces of grape sugar; in none were sporules of fungi; a variable though very small quantity of flour was present in the whole 15 sugars; animal matter was observed in 10 cases; sawdust, like fragments of woody fibre, in 12 cases; being very abundant in at least seven. In a second series of *brown sugars*, purchased more recently at different shops, the sugar insect or acarus was present in the whole of the sugars, the majority of the samples containing them in great numbers; sporules of fungi were in all; two out of the 36 were adulterated with flour› one with tapioca, and the other with potato flour.

In *arrowroot*, out of the 50 samples 22 were adulterated; in 16 cases the adulteration consisted in the addition of a single article, much cheaper in price and very inferior in quality to genuine arrowroot; this, in 10 instances, being potato flour, in five sago meal, and in one case tapioca starch; in five cases it consisted in the employment of two different articles, potato flour and sago meal; in two instances three different starches were employed —viz., potato flour, sago meal, and tapioca starch or fecula; 10 of the arrowroots contained scarcely a particle of genuine maranta or West India arrowroot, for which they were sold. One consisted entirely of sago meal; two of potato flour and sago meal; two of potato flour, sago meal, and tapioca starch; one of tapioca starch; and four were composed entirely of potato arrowroot or starch. In a second series of samples no less than 18, or one-half, were either adulterated, or else some inferior starch, as potato flour, was substituted; five of the samples consisted almost entirely of potato starch; the remaining 13 of mixtures, in various proportions, of potato starch and sago powder (these, in some cases, forming the chief part of the article), with occasionally other starches, as tapioca, canna, and curcuma starches. Arrowroot is commonly used by invalids, and therefore it is very important that it should be pure. It is extensively used in feeding children. It is not so much as a matter of health that the article should be pure, as a question of profit and loss. Articles employed in the adulteration resemble in their nutritious properties, to a great extent, genuine arrowroots.

In 43 samples of *black and white pepper*, more than half purchased previous to recent Excise convictions were adulterated; a much less though still considerable proportion of samples procured subsequent to those convictions were adulterated, by the addition of wheat flour in four cases, pea flour in one, ground rice in two, powdered mustard seeds in four, linseed meal in three, and of p. d. or pepper dust in two instances.

As to *mustard*, whatever be the price paid, it is scarcely ever obtained genuine. The whole of 42 samples were adulterated; in every case the same in kind, varying only in degree, and consisted in the admixture of genuine mustard with immense quantities of wheaten flour, highly coloured with turmeric. It is used not only as a condiment, but very largely by medical men, principally in the form of cataplasms, sometimes as an emetic. The adulterations would not, however, affect the utility of mustard in its medical appliance to any great extent, because as commonly sold it is always prepared in the same way, and the effects of a certain quantity are pretty well ascertained. That is a question again rather for the consumer. It has been stated that adulteration has been so generally practised as to compel the Government to make its mustard at a manufactory of its own.

In 34 samples of *chicory*, 14 were adulterated; in nine with roasted corn; scorched beans were present in four of the samples; in one a substance resembling ground acorn. In a second series of samples, 23 in number, 11, or one half, were adulterated; four with roasted wheat; the substance like ground acorn was present in an equal number of cases; three contained sawdust; mangel wurzel was detected in one of the chicories; and in one, roasted carrot. In the microscopical examination of chicory, out of 18 samples procured from manufactories, five were adulterated with roasted wheat flour; several yielded a coloured ash; out of the 16 samples of chicory purchased at the establishments of different grocers in the metropolis, one only was adulterated with roasted farina; the ashes of several indicated the presence of some red ferruginous earth, as reddle and Venetian red.

As to *bread* and its adulterations, the whole of 24 samples examined were adulterated with alum; in no one was potato or any other farinaceous matter, other than wheat flour, detected; nor did any contain either carbonate or sulphate of lime. In a second series, more recently, the whole of 25 samples, including three sold by the League Bread Company, contained alum; in none was potato detected.

In eight samples of *flour*, the important fact was ascertained, that four of the flours used by the bakers in whose bread alum had been detected, and who had questioned the accuracy of the analysis, also contained alum.

In *cocoa*, eight of 56 samples were genuine; sugar present in 48, the amount forming from five to, in some cases, as much as nearly 50 per cent. of the article; starch was detected in 46, varying from five to nearly 50 per cent., and consisting either of wheat, potato flour, sago meal, &c., or mixtures of these in various proportions. In the above 56 different samples of cocoa, out of the 10 samples of flaked cocoa which were incinerated, six contained earthy colouring matter; one of the two samples of granulated cocoa yielded a coloured ash; two of the three bromas contained earthy colouring matter; out of 14 samples of soluble cocoa, earthy colouring matter was discovered in 13; five of the 14 homœopathic cocoas contained coloured earth; the two roll cocoas were free from earthy colouring matter, which was present in seven of the nine samples of rock cocoa; the ash in one of the two cocoa pastes incinerated was coloured; of 12 samples of *chocolate*, in powder and in cake, earthy colouring matter was present in four; of 68 samples of cocoa and chocolate, 29 were free from earthy colouring matter, while the remaining 39 samples all contained coloured earthy substances in greater or less amount.

Oatmeal.—16, or more than one half, of 30 samples, were adulterated with large proportions of barley meal, while others contained the refuse husk, termed rubble. There was a case at Tooting some years ago which brought out very strikingly the effects of adulteration in this article. Many pauper children died at one time in the establishment. One fact, which came out in the coroner's inquiry, was, that the oatmeal was very largely adulterated with barley meal, and it was considered that this might have a great deal to do with the illness; they were reduced by diarrhœa; and it was thought that the barley meal, having a somewhat aperient property, and having been in daily use, might have been the cause.

Black and green tea.—The chief points ascertained with regard to black tea were, that the principal black teas (viz., the congous and souchongs) arrive in this country for the most part in a genuine state; certain descriptions of black, as scented orange, pekoe, and caper, are invariably adulterated; in general, in the glazing of the leaves with plumbago, or black lead; the caper likewise being subject to admixture with other substances, as paddy husk, lie tea, and leaves other than those of tea; several varieties of spurious caper, or black gunpowder, consist of tea-dust, and sometimes the dust of other leaves, and sand, made up into little masses with gum, and faced or glazed with plumbago, Prussian blue, and turmeric. In some cases these imitations are sold separately, but most frequently used to mix with and adulterate the latter qualities of caper, viz., those which are made of tea faced with plumbago only. With respect to green tea, the principal conclusions were, that these, with the exception of a few of British growth and manufacture, from Assam, are invariably adulterated; that is to say, glazed with colouring matter of different kinds. The Assam teas are all uncoloured, even those which profess to be green teas. In the black teas adulterations are practised, unfortunately, by the Chinese. The green teas, with the exception of a few from Assam, are invariably adulterated, that is, are glazed with colouring matters, in general Prussian blue, turmeric, and China clay, other ingredients being sometimes but not frequently employed. Prussian blue, or ferro-cyanide of iron, possesses properties calculated to affect health injuriously. In this country there is really no such thing as a green tea; that is, a tea which possesses a natural green hue. Green teas, and more especially the gunpowders, in addition to being faced and glazed, are more subject to adulteration in other ways than black teas, as by admixture with leaves not those of tea, with paddy-husk, and particularly with lie tea. Lie tea is prepared so as to resemble green tea, and is extensively used by the Chinese themselves to adulterate gunpowder tea; it is also sent here in vast quantities, and is employed for the same purpose by our own tea-dealers and grocers. In many cases I have been informed that it is marked lie tea by the Chinese themselves. Lie tea is a spurious article, made up with a certain proportion of tea dust, gum, and sand; it is made up into little masses, and afterwards faced with turmeric and China clay; it is expressly manufactured for the adulteration of tea. China clay is a white clay, forming a very fine powder, which gives a smoothness and gloss to the leaves. I have given the more important conclusions as to the condition of black and green teas, as imported; but these articles undergo further deterioration in our own country. Thus, in my work on food, I have adduced evidence to show that exhausted tea leaves are frequently made up with gum, &c., and resold to the public as genuine black tea; and when artificially coloured and glazed even as green tea. The Excise have instituted frequent proceedings in cases of the kind referred to. The substances employed in the colouring are, in many cases, very much more objectionable and injurious than those used by the Chinese, being often highly poisonous. It is no uncommon thing for tea, both black and green, to be fabricated from leaves not those of tea, and possessing no properties in common with the leaves of that plant. Black lie tea is often coloured, and extensively employed by our own dealers and grocers for the adulteration of green tea. With regard to the adulterations practised on green tea in this country, I may refer to what is a prevailing error. Many persons are in the habit, especially ladies, of examining the leaves coming from the teapot, expecting to find the whole leaves of some British plant, such as the plum or the sloe. I have never met with a single instance of the presence of any leaf except tea leaf in the teapot. When British leaves are used, they are prepared in a special manner. They are broken up into a powder, and mixed with catechu and gum, and so formed into little masses in the same way as the Chinese fabricate them, and then they are mixed with genuine tea leaves. When hot water is added to those masses, the catechu and the gum are dissolved by the hot water, and nothing remains but the leafy matter at the bottom of the teapot.

Milk.—In 26 samples purchased of different milkmen and dairy-keepers resident in London, 12 were genuine; two showed a deficiency of cream; 11 were adulterated in all cases with water, the per centage of which varied from 10 to 50 per cent., or one-half of the article. In no case was chalk, size, gum, sheep's brains, or any of the other substances said to be occasionally used for the adulteration of milk detected.

I have never found any adulteration in *cream* as yet; but I have not made any special inquiries on the same scale which I have in the case of milk. Annatto is commonly added to give a little colour; but of that there is not a great deal to be said.

Isinglass.—Out of 28 samples, 10, or more than one-third, consisted entirely of gelatine; the price for the genuine varied from 8d. to 1s. 4d. per ounce, while gelatine ranged from 10d. to 1s. 4d. per ounce.

Vinegar.—Out of 33 samples purchased of grocers, oilmen, and publicans, the amount of acetic acid, the most important constituent of vinegar, varied greatly in different samples, the highest per centage being 5.10, and the lowest 2.29, or less than half the first amount. Since the standard No. 24 vinegars submitted to analysis range for the most part considerably over four per cent.; vinegar to be deemed good ought to contain certainly not less than four per cent. of real acid. Judged by this standard, out of 23 samples of vinegar purchased of dealers in London, seven reached this strength, and contained from four per cent. upwards of acetic acid; the per centage of seven of the vinegars ranged between three and four, while in the remaining nine the amount of acid varied from two to three per cent.; it being, in two instances, as low as 2.40 and 2.29. 12 samples out of the 33 analysed contained no free sulphuric acid; a fact affording convincing proof that the use of this acid, so objectionable in many respects, is not necessary for the preservation of well-made vinegar. In eight samples, the quantity of sulphuric acid present did not exceed the amount formerly permitted to be added. In the remaining cases the amount exceeded this, and in some instances was three or four times as great. Since the manufacturers prepare and sell vinegar of different qualities, some being very weak, and since, as is well known, they commonly add sulphuric acid, it is clear that the blame of the present unsatisfactory condition of the article lies mainly with them; although, in some cases, the retailer adds sulphuric acid, burnt sugar, water, sour beer, and cider. In a second series of 28 samples, seven were entirely free from sulphuric acid or oil of vitriol; 21 were adulterated with that powerful and corrosive mineral acid, the amount of which was variable, and often very considerable, from 63 the lowest, to 6.02 the highest quantity in 1,000 grains; two of the samples contained it in very small quantity only; in three it was present in considerable amount; nine contained it in very considerable amount; in seven it was present in immense quantity. The acetic acid also varied very considerably in different samples, the highest proportion being, in 1,000 grains by measure, 56.66 grains, or 5.66 per cent., and the lowest 27.63, or only 2.76 per cent.; in eight the acetic acid was present in amount over five per cent., which is above the standard strength; in 12 samples the quantity exceeded four per cent.; in seven it was over three per cent.; in one the quantity of acetic acid present was so exceedingly small as to be under three per cent., that is but little more than half the proper strength.

Pickles.—19 out of the 20 samples owed a portion of their acidity to sulphuric acid, amounting in some to over two and a half grains per thousand; the largest quantity of this acid was detected in red cabbage; in the whole of the 16 different pickles copper was present; two of the samples contained it in a small amount, eight rather much of it, one a considerable quantity, three a very considerable quantity; in one copper was present in an amount deleterious; and in two, in amounts which might be almost considered to be poisonous. The largest quantity of copper was in those which consisted entirely of green vegetables, as gherkins and beans.

Ground Ginger.—Out of 21 samples, no less than 15, being more than two-thirds, were adulterated with sago meal, potato flour, wheat flour, ground rice, cayenne pepper, mustard husks, and turmeric powder; these occurring in various quantities, but in the majority of cases constituting the principal part of the article.

Cinnamon.—Of 31 samples seven were genuine, and five consisted of nothing but cassia. While the prices per ounce for the whole cassias varied between 6d. and 1s., one being charged 6d., three 8d., and one 1s., those for the cinnamon also varied between 6d. and 1s., one being charged 6d., three 8d., and three 1s. Out of 19 samples of ground cinnamon, three consisted entirely of cassia; 10, or more than one-half, were adulterated with either baked wheat flour or sago meal, separately or in combination; East India arrowroot and potato flour were likewise detected, each in one instance. Of the above adulterated samples, three consisted of cassia adulterated, and seven of cinnamon adulterated. Six only of the 19 samples were genuine. The prices per ounce for the powdered cassia substituted for cinnamon were 6d. and 8d. The prices paid for the genuine powdered cinnamon were 6d., 8d., and 1s. per ounce. The prices charged for the adulterated articles, whether cassia or cinnamon, were, one at 4d., three at 6d., and six at 8d.

Nutmegs.—The conclusions arrived at from the examination of 18 samples were, that nutmegs, as they reach the consumer, are not in general deprived of their essential oil, a result contrary to the opinion commonly entertained on this point; and that as met with in the English market they are seldom limed.

Mace.—The whole of 12 samples examined were genuine.

Cloves, as ordinarily met with, are not deprived of any part of their essential oil; the whole of the powdered cloves were free from adulteration; one sample contained a proportion of ground clove stalks.

Pimento.—Of the 21 samples, one only was adulterated, a result mainly attributable to the great cheapness of this spice.

Mixed Spice.—Of 26 samples, 16, or considerably more than one-half, were adulterated; of all the spices, mixed spice is the most liable to adulteration.

Cayenne Pepper.—Out of 28 samples, 24 were adulterated; 22 contained mineral colouring matters; red lead, often in poisonous quantities, was present in 13; Venetian red, red ochre, or some other analogous ferruginous earths, were in several samples; cinnabar, vermilion, or sulphuret of mercury, was in one sample; six consisted of a mixture of ground rice, turmeric, and cayenne, coloured with either red lead, or a red ferruginous earth; six contained large quantities of salt, sometimes alone, more frequently with rice and a red ferruginous earth, or with red lead; one was adulterated with a large quantity of the husk of white mustard seed; two contained rice only, coloured with red lead or a ferruginous earth. Red lead is often present in cayenne in an amount sufficient to injure health, provided it be taken all consecutively, two or three times a week, for instance.

Snuff is adulterated with another preparation of lead, chromate of lead, and not to a larger extent than red lead is present in cayenne, and several cases have been recorded of paralysis by the use of snuff containing lead; if snuff, which merely passes up the nostrils, will give rise to paralysis, it is extremely probable that cayenne will do so when introduced into the stomach, especially in curry powder, in which far larger quantities are taken of it than when taken alone. The effects of red lead upon the system are accumulative, and it is not discharged from the system very easily. None of the metals are easily expelled from the system; they are all apt to accumulate, but lead of any kind, and mercury, are particularly liable to accumulate, and do so. A person who was a great consumer of cayenne pepper might accumulate a large portion of red lead in his system, and he might find his health very much disturbed, even though the symptoms did not go to the extent of paralysis. There have been several well-attested cases, showing the effects which have been produced in all probability by the use of snuff; but as to cayenne pepper, we are without any evidence as yet; and I think that is owing to the fact that the case has not yet received much attention. It has not been known till lately that cayenne has been subject to adulteration with red lead to the extent it is. The great object of the adulteration is this:—cayenne in many cases is exposed to the light of the sun in shop windows, and it is very apt from that exposure to lose its colour. If any mineral colouring matter be used, the cayenne will stand exposure, and not appear to fade. It really does fade; but then the colouring matters added make up for the deficiency of colour. When we see particularly red pepper, it is a suspicious circumstance, but not conclusive, because the addition of salt to cayenne pepper heightens its colour in a very remarkable manner, and makes it more vividly red than even red lead would do. Much of the red pepper imported in a ground state from India contains salt.

Curry-powder.—Of 26 samples, seven only were genuine; 19, or nearly four-fifths, were adulterated; ground rice, usually in very large quantities, in nine samples; potato farina in one; salt in eight; the highly poisonous metallic oxide, red lead, in no less than eight; in seven the adulteration consisted of ground rice only; in one it consisted of ground riceand salt; in one of ground rice and red lead; in three of salt only; in three of salt and red lead; in three of red lead only; in one of red lead, potato farina, and salt.

Bottled Fruits and Vegetables.—Of 33 samples, seven were free from contamination with copper; 27 more or less impregnated with that metal; traces of copper in three; in seven copper was present in small amount only; eight contained it in considerable amount; in six the metal was present in very considerable amount; four contained it in very large quantities, amounting almost to a poisonous impregnation; the two samples of *limes* contained copper, one in small amount only, the other more considerable; *gooseberries*, as commonly preserved, contain a considerable amount of copper, and some samples even a very large quantity; *rhubarb* usually contains an amount of copper more considerable, some samples to a very large extent. A gentleman wrote to the *Lancet*, stating metal being frequently present in a highly dangerous amount.

noticed that it presented a very peculiar appearance, much more green than it should be, and partook of it with suspicion, but he did eat some of it; and on looking at his steel fork, he found the prongs covered with copper. The quantity necessary to colour the prongs is not very great, but still it must have been there in considerable amount to have done that, looking to the quantity of rhubarb eaten, for there was a bright coating of copper on the fork. There is a great deal of oxalic acid in rhubarb, but that could not convey the bright appearance which is given by the metallic character of copper. The object of this species of adulteration is to make the vegetables or fruit retain a green appearance. It is altogether unnecessary, because the colour produced by copper is by no means a desirable or natural colour; and so convinced of this are some manufacturers that they have ceased, since these exposures, to use copper at all; and the appearance and the flavour of the articles are, to my mind, very much improved by the omission. The effect of the addition of copper to bottled fruits is such as to be detected by the eye alone. Since these exposures took place, a very great difference is perceptible in the colour of green preserved fruits in the shop windows; but there is a great deal of that adulteration practised still. The fraud was wholly unnecessary, and some of the traders themselves begin to see that it was so. The fruits are put up in this country, and are largely exported. Another reason why copper was used was, not only to produce for the time a certain amount of greening, but to make them keep their colour for an indefinite period, so that they might be always saleable. Some of the crystallised fruits which come over from France contain copper; those which are preserved in syrup. In pickles, bottled fruits, and vegetables, the adulterations are entirely practised by the manufacturers. In some cases, the addition of copper enables them to sell fruit or vegetables in the shape of pickles or preserves which would otherwise present, from their being of an inferior character, a distasteful appearance to the eye. No doubt that consideration operates to some extent. It is not therefore a wholly gratuitous and purposeless fraud. *Greengages* in general contain a still greater quantity of copper, the that he had partaken at dinner of some rhubarb tart; he had

In *olives* this poisonous impregnation is in the largest amount, although its effect in heightening the colour is less marked than in the other cases; I think, speaking from memory only, it appeared that the Spanish olives were found not to contain copper, while the French olives did so. That is to be explained by the fact that Spanish olives are allowed to get riper, and have more oil in them, and are not intended to look green.

Anchovies.—Of 28 samples, seven consisted entirely of Dutch fish; two of a mixture of Dutch fish and anchovies: the brine in 23 was charged with either bole Armenian or Venetian red, varying considerably in amount, but in most cases to such an extent that they might be collected from the bottom of the bottles almost by teaspoonfuls.

Potted Meats and Fish.—The samples of potted tongue and ham were entirely free from adulteration; four out of five samples of *potted beef* were artificially coloured with bole Armenian; the whole of the samples of *potted bloaters* examined were highly coloured with this earth; one of the samples of *bloater paste* was adulterated in addition with a large proportion of starch or flour, probably wheat flour, boiled; all the samples of *anchovy paste* analysed were still more vividly coloured with bole Armenian; two of the anchovy pastes were, in addition, adulterated with flour, one with a large per-centage; of 28 samples of potted meats and fish, 23 were more or less impregnated with bole Armenian, which contains iron; and iron, even when taken in very small quantities, is very stimulating; it would have a tonic effect, which in some instances might be desirable, but in others very undesirable indeed.

Sauces.—Treacle and salt formed the basis of the five samples of *India soy* examined, if they did not even entirely consist of these two ingredients; in *Lazenby's Harvey's fish sauce* much oxalate of lime and numerous minute chips of charred deal were detected, the presence of these last affording some countenance to the inference that they had been used to impart colour: of seven samples of *tomato sauce*, six were artificially coloured, one, probably, with cochineal, the rest with considerable quantities of bole Armenian; the samples of *essence of lobsters* were almost saturated with this earth; *essence of shrimps* to an equal extent; the whole of the samples of *essence of anchovies* also with bole Armenian; three of the samples of *essence of anchovy* contained but a small quantity of muscular fibre of the fish; two a proportion of flour, one being a sample of essence of shrimps, the other of essence of lobster; out of 18 *red sauces*, 16 contained bole Armenian, usually in immense quantities, far exceeding what was detected in any of the potted meats and fish; lead, for which separate analyses were made in each case, was not detected in a single instance; traces only of copper in some three or four samples.

Preserves and Jams.—Raspberry jam contained a very considerable quantity of copper, arising, no doubt, from the copper vessels in which they are prepared. There is no advantage gained to the preparers of red jams from the introduction of copper; it is an accidental impregnation, and would apply as much to the jams made in one's own house; it is desirable that copper should not be employed in the preparation of jams at all. Four samples of *gooseberry jam* examined all contained copper. Copper, sometimes in large amount, was detected in 12 of 14 samples of *orange marmalade*, not purposely added; it arose from the action of the marmalade upon the vessel in which it was boiled. What is called orange marmalade is not always composed of oranges. Three of the marmalades were adulterated with large quantities of a vegetable substance, probably either turnip or apple. Nine samples of *greengage jam* were all more or less impregnated with copper, it being present in considerable amount in five. The greengages contained in three different boxes of crystallised fruits all owed their deep green colour to copper; the limes and greengages also owed their brilliant colour to a salt of copper. Copper was present in the three samples of *candied citron peel;* also in no less than 33 of the 35 samples of different preserves; three contained traces only; in 11 the metal was present in small quantity, and in 19 either in considerable or even very large amount.

Lard is not unfrequently extensively adulterated with water and potato flour, as well as certain saline substances, as salt, potash, alum, carbonates of potash and soda, and caustic lime, intended either to cause the lard to hold water or to improve its consistence and colour. The description most liable to adulteration is keg lard, particularly that manufactured in England, Irish keg lard being but rarely adulterated; and of upwards of 100 samples of lard examined, and procured chiefly from retail dealers, seven only were found to be adulterated.

Butter.—All the salt butters examined contained variable and usually very large quantities of water, ranging, with one exception, from 8·48 to 28·60; the fresh butters likewise contained variable and often considerable quantities of water, in most cases very much less than in salt butters, the quantities ranging from 4·18 to 15·43; the quantity of salt contained in the salt butters varied from 1·53 to to 8·24, showing that no fixed rule is acted upon in salting butter; in the fresh butters the salt varied from 0·30 to 2·91; the percentages of butter contained in the samples ranged from 67·72 to 96·93; that is, some of the samples contained 20, 30, and in one case even nearly 35 per cent. of water and salt.

Tobacco.—The results obtained from the numerous analyses, chemical and microscopical, were to the following effect: that the tobacco-leaf itself presents certain peculiarities of structure by which it may be readily distinguished from the leaves of all other plants said to be employed in the adulteration of tobacco, especially in the form and structure of the hairs, and of the mid-ribs and veins. These peculiarities are so decisive as to enable the observer, by means of the microscope, at once to distinguish tobacco in all the forms of cut and roll tobacco, and even when the leaf is still more minutely divided, as in some kinds of snuffs. The majority of leaves not tobacco detected from time to time in adulterated tobacco also present certain peculiarities by which they may be all distinguished, not only from tobacco but from each other. While the structure of the tobacco leaf is constant, its composition varies very greatly, particularly as regards the quantity of gum and sugar it contains, and the amount of ash furnished on incineration: thus in the six samples of unmanufactured leaf tobacco, the amount of hygrometric moisture varied from 10·8 to 13·4 per cent., the extract from 40·8 to 60·0 per cent., the sugar from mere traces to 3·6 per cent., the gum from 7·4 to 10·1 per cent., and the ash from 10·6 to 22·6 per cent., it being composed chiefly of chlorides, sulphates, carbonates, and phosphates, combined with lime. In the eight samples of leaf stalk, the analyses of which are now given, the hygrometric moisture varied from 11·60 to 18·16 per cent.; the extract, from 21·04 to 39·85 per cent.; the sugar, from traces, to 4·91 per cent.; and the ash, from 20·00 to 28·24, these ashes being remarkable for the large amount of soluble salts which they contained. These differences are so considerable and varied as to render it manifest that, by imitating its chemical composition, tobacco may be adulterated to a considerable extent, without our being able to declare with certainty that it is so adulterated. In the unmanufactured tobacco, including stalk, the hygrometric moisture varied from 11·25 to 22·96 per cent.; the extract, from 23·20 to 51·20; the soluble ash, from 3·00 to 11·44; the insoluble ash, from 9·60 to 17·80; the total ash from 13·60 to 27·90; the sugar, from traces to 4·91. In the manufactured tobaccos the hygrometric moisture varied from 9·80 to 65·76; the extract, from 29·32 to 62·20; the soluble ash, from 3·24 to 7·60; the insoluble ash from 9·20 to 16·24; the total ash from 14·68 to 20·80; the sugar, from traces to 3·82. In the bird's eye tobaccos the soluble ash was very high, in consequence of the large quantity of mid-ribs these tobaccos contain. The extract from the negroheads and twists was, in some cases unusually high, as was also the quantity of glucose; these large extracts were, probably, in part due to the oil employed in the manufacture of these kinds of tobacco; but, principally, to the use of some saccharine solutions. Not one of the 40 samples of cut tobacco was adulterated with any foreign leaf, or with any extraneous substance of any description, other than with sugar or some other saccharine matter, which there is good reason to believe was present in several instances. The more common adulterations of tobacco consist in the addition of water, sugar, and salts; the presence of these, in amount sufficient to constitute adulteration, can only be declared with certainty, however, when they are in considerable excess, or by a comparison of the unmanufactured and manufactured leaf. The conclusions arrived at from the examination of 58 samples of cigars were that cigars and cheroots are but little subject to adulteration; the penny cigars even consisting, in the majority of cases, entirely of tobacco, although, no doubt, of very inferior quality. Cigars are, however, now and then met with, especially on race courses, at fairs, &c., made up of hay and brown paper. Notwithstanding the generally received opinions, opium was not detected in any of the 12 samples of Manilla cheroots analysed. From the examination of 43 samples of snuff, the conclusions were that chloride of sodium or salt is added in large and very variable quantities to all descriptions of snuff, the proportion ranging from 1·0 to as much as 12·8 per cent. Where the amount of chloride is less than 1·0 per cent., it is probable that it is derived from the tobacco itself as well as the water used to moisten it: the alkaline and earthy carbonates, chiefly carbonates of potash and lime, are likewise added to snuff, sometimes in considerable quantity. One of the samples yielded 3·9. It would appear, also, that in some cases the alkaline and earthy phosphates are in excess in snuff, as much as 7·0 per cent. of the former having been detected in one sample, and 4·8 per cent. of the latter in another: the alkaline sulphates are likewise somewhat in excess, amounting in one sample to 5·4 per cent.; in this case the addition may have been intentional: oxide of iron derived from different descriptions of coloured ferruginous earths, as red ochre, yellow ochre, and some of the brown earths, as umber, was present in upwards of two-thirds of the samples, amounting in one case to no less than 5·0 per cent.; while all the Scotch snuffs contained iron, the oxide of that metal was not present in any of the samples of Welch and Irish snuffs submitted to analysis. Chromate of lead was detected in nine samples, amounting in one instance to 4·6 per cent. It occurred in five out of nine samples of Scotch snuff, in one of four samples of Welch, and in one of three samples of Irish. Oxide of lead, probably in the form of red lead, was discovered in three cases, as much as three per cent. being found in one sample of Hardham's 37. Bi-chromate of potash was present in three samples; in two it was found in Scotch snuff, amounting in one sample to 6·2 per cent. Many of the samples contained a considerable quantity of silica, amounting in one instance to no less than 8·4 per cent. In some the addition was, no doubt, intentional. Genuine tobacco rarely contains more than 3·4 per cent., and usually much less. In most of the silicious residues of the ashes shiny particles were observed, which, under the microscope, presented all the appearances of powdered glass. Powdered orris-root was detected in two samples. The total weight of ash furnished by the incineration of the greater number of the snuffs examined, although many of them were very moist, much exceeded that of genuine tobacco after being dried. While the ashes of samples of the latter have been found to vary in weight from 10·6 to 22·6, those of snuffs not dried, many of which contained large per-centages of water, were in no case under 18·26 per cent., while in one instance it amounted to 35·54 per cent. Had the snuffs been dried before analysis, as was the tobacco, the difference in the weight of the ashes would have been much more evident. The average proportion of water in the moist snuffs is about 25 per cent. Looking, then, at the whole of the above results, it is evident that snuff is subject to a very large amount of adulteration, and that of a kind which is not only detrimental to the revenue, but highly injurious to health.

Coloured sugar confectionery.—The principal colours employed are yellows, reds, including pink and scarlet, browns, purples, blues, and greens. Of the yellows it appeared that 59 were coloured with chromate of lead; 11 with gamboge; while the colour of the majority was confined to the surface, in many cases it was diffused equally throughout the whole mass of the sugar used. Of the reds, 61 of the samples were coloured with organic pink colouring matters, consisting in most cases of cochineal; in 12 the colouring matter was red lead, red oxide of lead, or minium; in six cases the colouring ingredient consisted of vermilion, cinnabar, or bi-sulphuret of mercury. Of the browns, eight were coloured with brown ferruginous earths, either Vandyke brown, umber, or Sienna. Of the purples, two were coloured with a mixture of Antwerp blue, which consists principally of Prussian blue, and an organic red pigment, most probably cochineal. Of the blues, one was coloured with indigo; 11 coloured with Prussian blue, or ferro-cyanide of iron; 11 with Antwerp blue; in 15 the colouring matter consisted of German or artificial ultramarine, which is a sulphuret of sodium and aluminum. Of the greens, 10 were coloured with Brunswick green, which consists of a mixture of chromate of lead and Prussian blue; one sample was covered with verditer or carbonate of copper; nine with Scheele's green, emerald green, or arsenite of copper. These colours were variously combined in different cases; from three to seven colours occurring in the same parcel of confectionery; in four samples, the colours used were painted on with white lead, or carbonate of lead. This was the case in all the cake ornaments. 13 samples were adulterated with hydrated sulphate of lime, the quantity varying from 4·3 to 43·66 per cent.; 21 with different kinds of flour, in quantities varying from 1·66 to 25·66 per cent.; in 17, the farina consisted of wheat flour; in three of potato flour, and in one of East India arrowroot. Scarcely a year passes without very serious accidents happening from the employment of poisonous pigments in confectionery; there are instances of persons who have been killed by them, and many more of persons who have been taken seriously ill. The chief consumption of such confectionery is among children, upon whom the effect of adulteration is likely to be much greater than upon a grown person. I remember the instance of a public dinner in Essex, in which a person died in consequence of eating some of the confectionery thus adulterated; and several other cases are recorded in the *Lancet*. The coarsest articles are the most liable to adulteration; not with poisonous pigments, but with sulphate of lime, or quantities of flour and starch, which are cheaper than sugar. I found no marked difference between the confectionery which was bought in the better class of shops than that which was bought at the inferior shops; most of the samples of coloured sugar confectionery were purchased at what are called "sweet-stuff shops," some in Oxford-street, others in Tottenham-court-road, and in parts of the City. The adulteration of this coloured sugar confectionery does not apply to toffee and lollipops, which are made of brown sugar, and there is not much room for colouring there. There is an enormous consumption of this coloured confectionery; and judging from the number of those shops which exist now compared with those which existed three or four years back, it is certainly on the increase. The law does not provide a remedy against the use of any of the substances I have enumerated. It would be possible to colour them to a very great extent without having recourse to any injurious articles; there are many articles which are very simple and entirely innocuous. The

French Government found the use of poisonous colouring matter to be so extensive and dangerous, that they issued an Ordonnance in 1841 or 1842, forbidding the use of certain colouring matters, and pointing out to the manufacturers the precise colouring matters they may use. The colouring materials are used merely to gratify the eye, and to enable the manufacturers to prepare articles in the form of different fruits and vegetables. The adulteration of sugar confectionery is not alone confined to colour; it is extensively adulterated with hydrated sulphate of lime, flour, and starch. In some samples I have met with as much as 43 per cent. of plaster of Paris, which must be very injurious to the system. That is a cheaper article than sugar, and therefore is used for the purpose of pecuniary fraud, as in the case of the addition of various forms of starch and flour.

I will now proceed to the adulteration of London *stout* and *porter*; the samples of stout, either obtained from agents or purchased at the taps of several of the principal London porter brewers were considerably stronger than those procured from publicans. The alcohol, of specific gravity ·796; temperature 60° Fahrenheit, contained in the former samples, ranged from 7·15 per cent., the highest, to 4·53, the lowest; whereas that of the stouts procured from publicans varied, with one exception, from 4·87 per cent. to 3·25 per cent. The same difference of strength characterised the various samples of porter procured from the two different sources; the amount of alcohol in the porters obtained from the taps varying from 4·51 per cent. to 2·42 per cent.; whereas those purchased of publicans ranged from 3·97 per cent. to 1·81 per cent. In nearly all the stouts and porters salt was present, often in considerable amount. In some of the samples cane sugar and treacle were likewise present. There is reason to believe that the variation of strength would have been still more considerable had the samples been procured direct from the several breweries, instead of as in most cases from the brewers' taps. This diminution of strength in the beer purchased of publicans is only to be satisfactorily explained by the addition, in many cases, of water; this addition being, no doubt sometimes practised by the publicans and other retailers of malt liquors. The addition of water constitutes the principal, but not the only adulteration to which these beverages are subjected. Thus the addition of water reduces the strength, flavour, and colour to such an extent as to necessitate in some cases the further adulteration of the beer, and this is usually effected by means of a very coarse description of brown sugar containing much treacle, and known as foots, and salt. Since the use of cane sugar is permitted in the brewery, I did not attempt to ascertain which of the samples subjected to analysis contained that substance, because had I found it in any of the samples I should still have been unable to have declared whether the brewers or the publicans were the parties who made use of it. I believe, however, that the brewers do not often employ sugar, since it is alleged that beer made with any considerable proportion of cane sugar does not keep so well as that prepared from malt only. Moreover, the price of sugar forms an obstacle to its use in breweries. It appears from the analysis, that salt is almost constantly present in porter. This addition is made in the first instance by the brewers themselves; but there is no doubt that a further quantity of it is frequently used by the publican to assist in bringing up the flavour of beer which has been reduced in strength by the addition of water. The quantity of salt contained in porter is often sufficiently large to communicate a perceptibly saline taste to the mouth. The salt is used by the brewers in the following manner: it is first mixed up in a tub with flour, and the mixture is cast by handfuls over the surface of the wort in the cooling vat. It is said to assist in the preservation and fining of the wort, and that these are the only purposes for which it is employed by the brewer. The three usual and principal adulterations of porter consist, then, of water, by which its strength is reduced and its bulk increased; and sugar and salt, whereby its colour and flavour are in a measure restored. But there is good reason for believing, from evidence given before a recent committee of the House of Commons on public-houses, of which Mr. Villiers was the chairman, that other adulterations are practised, and that sulphuric acid, or oil of vitriol, salt of steel, or sulphate of iron, and cocculus indicus, are likewise not unfrequently used, and this both by the publican and the brewer. Not only is the fact of the addition of water proved by the present analyses, but evidence of another character has been supplied to the Committee above referred to, showing the same fact. It has been proved that a publican could not afford to sell porter in the state in which it is supplied to him by the brewers, and realise a profit upon it, unless he had recourse to adulteration.

I will now state my conclusions respecting the adulteration of *gin*, established from the analyses made of 38 samples; the strength in alcohol, of specific gravity, ·7,939 at a temperature of 60° Fahrenheit, of the various samples ranged from 15,645 grains to 34,160 grains per imperial gallon; the per-centages ranging from 22·35 to 48·80 per cent. It thus appears that some of the spirits contained only half as much alcohol as was present in other samples, and therefore that their commercial value was reduced to the enormous extent of more than one half; thus, supposing sample 2 to be worth 12*s*. per gallon, sample 35 would be worth less than 6*s*. per gallon. This variation in the strength of the spirits is *doubtless* principally attributable to dilution with water. The quantity of sugar ranged from 3 oz. 4 dr. 23 gr., to 13 oz. 4 dr. 13 gr. per gallon. Two of the samples contained oil of cinnamon, or probably of cassia. Seven of the samples contained cayenne pepper, some of them in very large quantity, so that the syrupy extract left on evaporation possessed a burning and fiery taste. In no case was sulphuric acid detected; its absence being sufficiently shown by all the samples being neutral to test paper. Most of the samples contained combined sulphates, derived from the water and alum employed in their adulteration and clarification. In some few cases possibly, the combined sulphates may be derived from white vitriol, white copperas, or sulphate of zinc, which I have the authority of a gin distiller for stating is commonly used, when gin has been diluted with water, for the purpose of causing it to "bead," as it is technically termed. Here then, we have evidence of a second adulteration injurious to health. It appears from the analysis of 19 samples of rum, that the strength varied from 25·61 per cent. of alcohol to 47·28 per cent.; that is, that some of the samples were nearly twice as strong as others, and consequently of nearly double the value. Six, or nearly one-third, were adulterated with cayenne, the extracts left on evaporation being exceedingly pungent from the presence of that substance. It is stated that gin is sometimes adulterated, or rather refined, with sulphate of zinc, but I have no knowledge of the practice of that adulteration, though I have reason to believe that it is practised. Whatever may be the evil consequences of drinking gin, those consequences are materially augmented by the use of these mixtures. I think no human stomach could stand the combined influence of alcohol and cayenne pepper. Pure gin should be alcohol flavoured with juniper berry; but I believe there is very little gin made in so simple a manner; it is flavoured with some special preparations called gin flavourings, made from various aromatic and carminative substances, orange peel, coriander, and a variety of things of that nature. I do not think gin flavourings are used to supersede the use of the juniper in any way, but the manufacturer conceives that, by the use of them, he produces an article which is better liked than if he were to use only juniper.

I will now proceed to *annatto*, a colouring substance which should be entirely vegetable; it is used largely in dyeing, and also in colouring cheese, butter, and cream. From the results of the microscopical and chemical examinations of 31 samples, it appears that chalk was present in 21, wheat flour in four, rye flour in nine, turmeric in three, salt in 19, an oily substance (probably soap) in several, a red ferruginous earth (probably Venetian red) in 19, copper in three; white lead in five. The greater part of the adulterations practised with annatto take place in this country.

I turned my attention also to the adulteration of drugs, and will state the analysis of four very important substances. The first is *jalap*. From the examination of the analysis of 33 samples, it appeared that no less than 14 were adulterated, or nearly one-half. This adulteration was in all the samples of the same kind, and consisted in the addition of large quantities of wood in a minutely divided state. The wood employed in 12 was of the same kind; in the other two a different description of wood was used, as was evident from the characters of the fibres. This adulteration amounted in some samples to one-third, the properties and strength of the jalap being, of course, impaired to that extent. One sample preparation of tincture. I believe that it is not an unfrequent much reason to believe that the resin had been previously extracted. From the analysis of *ipecacuanha*, it appeared that of 33 samples 18 were adulterated, or more than one-half; one contained a very large quantity of tartar emetic; two were adulterated with large quantities of carbonate of lime or chalk; two with wheat flour, one of these also containing a proportion of extraneous woody fibre; one sample was adulterated with a vegetable substance containing much starch; 12 with various and often considerable proportions of extraneous woody fibre of more than one kind. From the analyses of 23 samples of *gum opium*, as imported, it appeared that no less than 19 were adulterated, four only being genuine; the prevailing adulterations consisting of poppy capsule and wheat flour, many being adulterated to a very large extent; but in two cases sand, in one sugar, and in another gum, were discovered. From the examination of 34 samples of *powdered opium*, purchased of different chemists, wholesale and retail, it appeared that 31 were adulterated, the principal adulterations, as in the previous case, being with poppy capsule and wheat flour; four of the samples were further adulterated by the addition of powdered wood, introduced, no doubt, in the process of grinding. According to the analyses of the gum opiums, as imported, the amount of alkaloids, in which the active principles of opium reside, was found to vary from 2·7 to 14·0 per cent.; that is, in the proportion of nearly one to five. It is probable, however, that the Egyptian opium, which furnished only 2·7 per cent. of alkaloids, had been deprived of its morphia, and it was also adulterated with an enormous quantity of some gummy substance. The two gum opiums which furnished the next lowest amounts were, another sample of Egyptian opium, which contained only 3·7 per cent., and a sample of Turkey opium, which yielded but 4·2 per cent. of alkaloids. In the powdered opiums, the amount of alkaloids varied from 2·3 up to 12·2 per cent., or in the proportion of nearly one to six; that is, the samples differed in strength in that ratio. The lowest amounts of alkaloids furnished by the powdered opiums were 2·3 and 3·2 per cent.; these were, in all probability, exhausted opiums which had been previously employed in the yielded only 5·37 per cent. of extract; and there is, therefore, practice with druggists to employ the insoluble residue, when dried and pulverised, left from the preparation of the tincture of opium in the adulteration of powdered opium; I have also known it to be used for making the *unguentum gallæ compositum.* Opium is one of the most important medicines in the whole Materia Medica, and any adulteration of it must be proportionally injurious, and sometimes even fatal. It is used in cholera cases, and in *delirium tremens* it is administered to the extent of many grains *per diem;* and it is essential, in such cases, that the opium should be good. If you were to employ opium largely adulterated, the consequence in many cases would be, that you would lose your patient.

Adulterations of drugs may be divided into two classes; those which are practised before they reach this country, and those which they experience after their arrival. In all cases you cannot insure obtaining a genuine drug from any seller of drugs in this country, because he cannot answer for what may have been done with the drugs before they reach his hands. I never met with any adulterated article from Apothecaries' Hall, but I have not examined more than three or four samples coming from there. I should think, as that is a recognised and regularly constituted body, you would be tolerably secure of getting genuine drugs from them whenever it was possible to procure them. Opium is subject to adulteration before it arrives in England; but there are analyses conducted on a large scale in India by the East India Company before they sell the opium; they have inspectors to examine it as it is brought to the factory. A great many drugs pass from the wholesale dealer to the drug-grinder, whose business it is to reduce them to powder, and a very large proportion of the adulteration practised, I have no hesitation in saying, is due to the drug-grinder. I think it is very probable that other witnesses will bear testimony to that fact before this Committee. The way in which it is done is this. A person having a drug which he wishes ground forwards a given weight of it to the drug-grinder, to be returned to him of the same weight; sometimes it is even ordered to be returned weighing so much more. Now, in the process of grinding, part of the moisture which all vegetable substances contain escapes, and that loss is made up by adulteration; and not only is it made up, so that the original article is returned of its full previous weight, but sometimes even over that weight, according as may be desired by the person sending the drug to be ground. Sometimes the grinder does it on his own account as well. I would not bring that as a charge against the whole body of drug-grinders, but it has been done. The practice, however, which I now describe, of sending a drug of a certain weight to be reduced to powder, requiring that it should be returned without any allowance for loss, is common.

The last drug I will mention is, *scammony*. The conclusions deducible from the examination of 30 specimens of this drug were these: out of 13 samples as imported, one only was genuine, yielding 79·60 per cent. of resin, the active principle; 11 were more or less adulterated, the amount varying from 8 to 75 per cent., and the proportion of resin from 46·20 to 72·00, one sample having only 13·20 per cent.; one sample was entirely factitious, being composed of resins of guiacum and jalap, with much woody fibre, cellular tissue, and other insoluble matter; the adulterating ingredients consisted for the most part of impure carbonate of lime or chalk, wheat flour, sometimes sand, or other earthy substance, gum, and considerable quantities of woody fibre and cellular tissue; of 17 samples of powdered scammony purchased of various druggists, one only was genuine, affording 76·40 per cent. of resin; the whole of the remaining samples were adulterated, frequently to an enormous extent; the adulterating ingredients constituting from 18 to about 65 per cent. of the entire article, and the resin varying from 27·20 to 65·60 per cent., that is, some of the samples contained little more than one-fourth the proper quantity of scammony, and of course were deficient to that extent of the active properties which they should possess; the adulterating ingredients consisted principally of large quantities of wheat flour, with frequently some chalk, and occasionally sand, or other earthy substance.

I have now described, in as condensed a form as the subject will admit, the nature of the principal evidence I have to offer, by which the fact of adulteration and its prevalence is proved. I pro pose next to take up the subject of adulteration considered as a question of public health.

No one can doubt that the subject of adulteration is one of high importance in a sanitary point of view. In the first place, the adulteration of articles with substances harmless in themselves is prejudicial, by reducing and weakening the properties of those articles. This is the case when roasted corn or carrot, &c., is added to coffee, water to milk, &c.; but the remark applies especially to medicines, for in this case to reduce the strength of a medicine by adulteration is to destroy or modify the proper action of that medicine. The proper doses of different medicines have been determined in most cases by careful observation and experiment, and in different doses the same medicine is known to produce very different effects. To adulterate medicines even with harmless substances is, therefore, to destroy the very foundation of the healing art, and render nugatory the best directed efforts of the physician. In the second place, adulteration acts prejudicially to the public health, when substances are employed possessing injurious properties, a great variety of which are used for the purpose. I have myself detected the following:—chromate of lead, red oxide of lead, or red lead, arsenite of copper, sulphate of copper, carbonate of copper, or verditer, carbonate of lead, or white lead, bi-sulphuret of mercury, or vermilion, acetate of copper, sulphate of iron, gamboge, bronze powders, which are mixtures of copper and zinc, sulphate of lime, and other articles more or less injurious. This list, it will be observed, contains the names of some of the most virulent poisons. Sometimes the quantity of these substances used is so considerable, that immediate ill effects are produced. Not a year passes but that many serious accidents arise out of the practice of colouring sugar confectionery with poisonous pigments; more frequently the effects are more slowly developed. The substances, although taken in but minute quantities, gradually accumulate in the system, until at length serious consequences are produced. In proof of this I may mention that several cases of paralysis have recently been traced to the use of snuff adulterated with lead. One of these cases rests upon the authority of Professor Erickson. He followed that case out minutely, and has furnished a very careful record of the symptoms which characterised it. The result of the discovery of the cause of illness was, that though the patient was an old man, he to a great extent recovered the use of his limbs again. With such evidence as the above, I think it is impossible to contend that the use of such a variety of injurious and even poisonous substances is unattended with danger, and that adulteration does not affect the public health. It may happen, and it doubtless does sometimes occur, that the same person, in the course of a single day, receives into his stomach some eight or ten of the articles which I have enumerated. Thus, with the potted meats and fish, taken at breakfast, he would consume more or less bole Armenian. At dinner, with his curry or cayenne, he would run the chances of a dose of red lead; with the pickles, bottled fruits, or vegetables, he would be nearly sure to have copper administered to him; while, if he partook of *bon-bons* at dessert, there is no telling what number of poisonous pigments he might consume. Again, at his tea, if mixed or green, he would certainly not escape without the administration of at least a little Prussian blue, and it might be much worse things. If he was a snuff-taker, he would be pretty sure to be putting up his nostrils, from time to time, small quantities of either some ferruginous earths, chromate of potash, chromate of lead, or red lead. If an invalid, his condition would be still worse; for then, in all probability, he would be deprived of much of the benefit of the skill of his physician, through the dilution and sophistication to which the remedies administered for his relief were subjected. This is no fanciful or exaggerated picture, but one based upon the legitimate conclusions derived from the analysis of different articles as sold to the consumer.

I wish to make a few observations as to the powers and capabilities of the microscope as a means of detecting adulteration. Vegetable substances possess an organisation or structure visible only by the aid of the microscope, and the differences of organisation are so great and decisive, that by them most of these substances may be distinguished one from the other, and this when they are pulverised and even scorched and roasted. All that is required for this purpose is a knowledge of the structures by which the different substances are characterised. Thus, the structure of coffee is very different from that of chicory, of wheat flour from that of oats, and so on. It was by means of the microscope that I succeeded the other day in detecting in a sample of a vegetable powder, termed pheasant powder, used to feed pheasants, sent to me for examination by Dr. Rowson, of Lichfield, no less than 11 distinct vegetable substances, as linseed, aniseed, cayenne, black and white mustard, wheat flour, the seed of the cytissus, and at least four other substances. Now this could never have been effected by chemistry; the most accomplished chemist would hardly have succeeded in detecting more than one of these substances, and hence the great value of the microscope as a means of discovering adulteration. Until recently, the power of the microscope in this particular application was nearly unknown. So recently as 1851, the then Chancellor of the Exchequer was enabled to quote in the House of Commons the opinions of three of the most distinguished chemists of the day, who had been employed by the Government specially to report upon the subject, "that neither by chemistry nor by any other means was the admixture of chicory with coffee detected." At the very time this statement was made, I had shown that the detection of this and other similar admixtures was most easy and certain. Until the microscope was brought to bear upon the subject, however, no means existed whereby the great majority of adulterations could be discovered, and the parties practising them little dreamt that an instrument existed capable of bringing to light their secret and guilty proceedings. Adulteration was then practised in security, and with comparative impunity; now this feeling of security has been destroyed, and the adulterator knows that at any time he is liable to discovery. Up to the period of the general application of the microscope to the discovery of adulteration, the officers of the Excise were driven for the most part, to seek for evidence of adulteration by forcible entry, and the seizure of articles upon the suspected premises. The objections to this method of proceeding are obvious now; in most cases the fact of adulteration can be proved without forcible entry, by the simple purchase of the suspected article, and subsequent application, to its analysis, of the more extended resources of science which exist in the present day. The means which I think should be employed for the suppression of adulteration are of two kinds. The first include those which are required for the detection of adulteration, and the second for its prevention. For the former it is requisite, first, that there should be a Central Board composed of scientific analysists, microscopical and chemical, under the direction of which purchases should be made from time to time, analyses instituted, and periodical reports published. Secondly, that examining inspectors should be appointed, to keep a close watch upon all suspected articles, to make purchases of samples, and to forward them to the Central Board to be analysed and reported upon. These inspectors should be appointed at all the more considerable export and import towns, to prohibit either the importation or exportation of adulterated articles of all kinds. They should likewise be appointed and have their residence in all the large inland towns, certain districts being assigned to them in connexion with those towns. Thirdly, that a cheap treatise on adulteration should be published, emanating from the Central Board. This should be illustrated with wood-cuts, showing the microscopical appearances and structure of the different articles, both genuine and adulterated, and containing plain directions for the discovery of adulteration. Such a treatise, if carefully prepared, would prove of the greatest value in checking adulteration. There are now some hundreds, probably thousands, of microscopical observers, scattered throughout the country; many of these, if furnished with the means which a work of the kind indicated would supply, would gladly apply themselves to the detection of adulteration; and thus the more frequent exposure of adulteration would be insured. Lastly, for the more effectual discovery of adulteration, the public might be invited to forward to the Central Board, under seal, and with the names and addresses of the parties of whom the samples were procured, articles in their possession, suspected to be adulterated. For prevention, the following are the measures which appear requisite. A system of publication of the names and addresses of all persons whose goods have been analysed should be adopted, and this whether the articles on examination proved to be genuine or adulterated. The seller of adulterated articles should be punished by the infliction of fines; the actual adulterator should be punishable by fine or imprisonment, or both. I would wish to observe, that I am disposed to rely for the suppression of adulteration much more upon the free publication of the names and addresses of the parties whose goods have been subjected to analyzation than upon the infliction of fines or imprisonment; nevertheless, I believe that both these means of punishment are requisite. At the present time, the adulteration of all articles upon which an Excise duty is levied is punished, when discovered, by heavy pecuniary penalties; but the Excise does not take notice of adulteration in non-exciseable commodities, which adulteration, therefore, at present for the most part escapes punishment altogether. The punishment by imprisonment should be reserved for aggravated cases, and for the actual adulterator. This punishment I conceive to be necessary, in order that the offence of adulteration may be stigmatised by the law, as it deserves. It is one which has long been in existence in France, where it is not unfrequently inflicted. For the suppression of adulteration in certain articles, as beer, spirits, milk, and coloured sugar confectionery, special regulations might be had recourse to. The value of beer and spirits may be estimated by the quantity of alcohol which they contain. The more these are adulterated by dilution, which is the ordinary adulteration practised, the less alcohol they will be found to contain. It might, therefore, be rendered imperative that the different kinds of malt liquors and spirits in use should not be sold under certain fixed or standard strengths in alcohol. This regulation is proposed for the protection of the Excise, and not as a question of health. I may mention that it is one which is already in force in the case of the sale of spirits by the distiller. The value of milk, with certain precautions, may be estimated by its weight; and all milk sold under a certain weight might be declared to be adulterated, as is done in France and some other continental states. Lastly, in the case of coloured sugar confectionery, a list of all the injurious or poisonous pigments employed should be made out, and their use prohibited, as has been done in France for many years past. No objection, I believe, exists to the scheme thus briefly set forth on the score of expense: on the contrary, while a considerable saving of expense would ensue to the consumer, the revenue would be greatly benefited and the public health protected. The requisite machinery is already in existence, that of the Excise, consisting of analyists and inspectors. The Excise, however, has failed to accomplish, to a great extent, this object; further, it takes no cognizance of any adulterations which do not immediately affect the revenue, no matter how detrimental these may be to the public health. Nearly all, therefore, that appears to be requisite in order to insure, to a very great extent, the suppression of adulteration, is, to remodel the detective and analytical departments of the Excise, and to enlarge the sphere of their operations. The analytical department should be made to take cognizance of all adulterations, whether in duty-paying articles or in articles free of duty. The best way, perhaps, would be to institute a separate Board, to which the analytical department of the Excise could be transferred, and to place the various Customs and Excise detective inspectors in communication with this Board. Adulteration is very injurious to the revenue; there are no exact data upon which the precise amount of injury to the revenue can be calculated, but sufficient data exist for one to be able to state that the loss to the revenue from adulteration must amount annually to some hundreds of thousands of pounds. A witness who gave evidence before the Committee on public-houses gave it as his opinion that the loss to the revenue arising out of the adulteration in a single article, beer, was not less than £100,000. The gentleman who gave that evidence was Mr. M'Culloch, who was, for many years, if he be not now, connected with the Excise, and who is thoroughly conversant with the subject on which he was speaking. I attribute the failure of the Excise to suppress adulteration in exciseable articles to several causes; to the conduct of the Excise with regard to coffee, in so long permitting the admixture of chicory, which, for a long time, was allowed to be sold with coffee, and as coffee, without any interference on the part of the Excise. I attribute it also to the small number of exposures of adulteration made by the Excise, and to their not having sufficiently availed themselves of all the resources of modern science for the detection of adulteration, and especially of the microscope. As to the propriety of legalising the sale of mixtures, as is done now in the case of coffee and chicory, I should then be most unwilling to legalise them unless a very strong case could be made out for their necessity. The objections to these mixtures are, that they appear to give a legal sanction to adulteration; that the mixtures are often sold for the genuine articles. I know, from personal experience, that to be so at the present time with regard to coffee and chicory; people go into different shops and ask, perhaps, for two ounces of coffee; it is a very common thing for them to get a mixture of coffee and chicory, and then, if they complain of it, the right article is given, and the first is passed off as a mistake, or it was supposed that they would prefer to have it, it being so much better. These mixtures are also objectionable, because the quantities of the several ingredients entering into the mixtures are subject to the greatest variation; thus, of the mixtures of chicory and coffee sold, many consist almost entirely of chicory; and also, because the price charged for these mixtures is often as much as for the genuine article, the consumer being a great loser. Certainly, if in any case these mixtures are permitted, it should be required that the ingredients of which they are composed, and the proportions in which they are mixed, should be clearly specified.

WEDNESDAY, JULY 18TH, 1855.

ARTHUR HILL HASSALL, M.D., FURTHER EXAMINED.

I HAVE brought with me specimens of *bottled fruits* and *vegetables* preserved without copper, and also corresponding specimens which have been greened with that mineral. The Committee will at once perceive, by the eye alone, the very great difference which exists between them; those without copper are of a pale yellowish green colour, while those with copper are of a deep blue colour. When the fruit and vegetables are cooked the difference becomes still more obvious and striking; while the natural fruit or vegetable undergoes but little change of colour, that with the copper becomes of a still deeper blue. The specimens free from copper were put up by Messrs. Crosse and Blackwell, one of the largest and oldest establishments of the kind in London. The practice of artificially colouring all green pickles and fruits with copper prevailed almost universally until the publication of the reports in the *Lancet*, and Messrs. Crosse and Blackwell have acknowledged that they themselves adopted the practice until that time. Since then, however, they have entirely ceased to use copper, being convinced that the practice was bad and unnecessary. For this change on their part great credit is due to them, because in many instances by so doing they run counter to the wishes and tastes of their customers. Messrs. Crosse and Blackwell state, however, that although the change occasioned inconvenience at first, they have now begun to reap the benefit of it in increased custom. They have likewise nearly abandoned the use of bole Armenian in the colouring of the red sauces, potted meats and fish, &c., and now propose to do so entirely. I have here two bottles of *anchovy sauce*, one prepared in the usual manner with a proportion of bole Armenian, and the other without; the proportion of the bole Armenian employed is 10 pounds to 100 gallons of the sauce. In some cases I should think the colouring ingredient would have a prejudicial effect; it contains iron, and that might, with some persons, act prejudicially; at all events the addition of that substance is nothing more nor less than the addition of so much dirt. This uncoloured sauce is some that Messrs. Crosse and Blackwell have just had made, to see what article they could produce without using any colouring matter, and they now propose to sell that only.

I have also brought with me a few specimens of *coloured sugar confectionery*, in order that the Committee may see how coarsely and grossly they are coloured. They have not been analysed, because to do so would be to destroy them to a great extent; it would lead to the removal of the colour. I can judge sufficiently, however, by the eye alone, to be able to state that chromate of lead, red lead, Prussian blue, Brunswick green, which is a mixture of Prussian blue and chromate of lead, arsenite of copper, gamboge, and cochineal are amongst the pigments with which the articles are coloured. There is sufficient in one of those cakes to produce some little temporary derangement; and if a child were to be in the habit of daily eating two or three of those cakes, it might injure it very seriously. Articles of that kind are extensively eaten by children, but not so much so as they were a year or two ago. Since the publication of the reports in the *Lancet*, a great difference is to be observed in the colours which are exhibited in the shop windows. I have here a list of colours, the use of which may be permitted in the colouring of sugar confectionery: yellows—saffron, turmeric, French berries, Persian berries, Quercitron bark, fustic wood, and lakes of the four last-named colours. Reds—cochineal, cake ditto, including carmine, Brazil wood, madder, and lakes of the two last colours. Purples—madder purple, logwood, and indigo; any of the lakes with indigo or litmus. Blues—litmus and indigo. Greens—sap-green, which is the juice of *rhamnus catharticus*, yellow lake or French berries, and indigo; mixtures of any of the vegetable yellows or lakes with indigo, including Persian berries and indigo. Care should be taken to ascertain that the sap-green and litmus are pure; the first is liable to adulteration with copper, and litmus is stated to be sometimes adulterated with arsenic and peroxide of mercury.

I have made some observations on the importance of the microscope as a means of detecting adulteration. I wish now to refer to an instance in which the neglect to employ microscopical observations led to a serious mistake. In 1851, Sir George Grey issued a Commission to inquire into the State of the Water Supply of the Metropolis, the commissioners being Professors Graham, Miller, and Hoffman, chemists of distinguished ability, but not microscopists. I have the Report of these gentlemen, and I find at page 8 the following statement:—"In these waters, when submitted to microscopic examination, no animalcules were observed in any case; but the period of the year was not that at which any considerable development of animal life is to be looked for." Upon that I would remark, that for many years I have examined, at all seasons, the water of the Thames water companies, and in no case have I met with a single sample of that water in which living organic productions were not to be discovered. I therefore have no hesitation in declaring that this statement is wholly erroneous, and that the Government were seriously misled by it in a most important matter. The only way of accounting for the mistake is, that the commissioners, not being microscopical observers, were not competent to make the examination. I have made these observations, because I am desirous that the great value of the microscope in analysis should be generally known and appreciated, which, until recently, it has not been, even by scientific men.

I have made some remarks upon the practice pursued by many drug-grinders, of adding different kinds of sawdust to drugs, under pretence of cleaning out the mill, but really in order to make up for loss of weight resulting from drying and powdering, and for adulteration. In 1848, Mr. Redwood, professor of chemistry to the Pharmaceutical Society, published in the *Pharmaceutical Journal* an article on drug-grinding, from which I will quote, in corroboration of my remarks:—"Sawdust, then, is as indispensable at a drug-mill as water is necessary in a druggist's shop; and if the druggist sends damp jalap containing 15 per cent. of water to be ground, and requires dry powder to be returned with only 4 per cent. of reduction for loss, he adopts a conventional method of asking for some of the rinsing of the mill, veritable powder of post." Again, in the evidence of Dr. R. D. Thomson, given before a Select Committee of the House of Commons, to inquire into the Administration of Relief to the Poor, it is stated "that it is common to send to the drug-grinders 84 pounds of jalap to be made into a hundredweight."

I have been asked whether any machinery exists in the Nuisances Removal and Diseases Prevention Act, which might be made available for the suppression of adulteration. I have consulted the Act, but I do not find in it the requisite machinery. It suggested itself to me, however, in the perusal of the Act, that the various local Boards of Health scattered throughout the country might, if placed in communication with the Central Board in London which might be established for the purpose of exposing adulteration, render very important service. There is a clause imposing a penalty not exceeding £10 on the sale of meat, fish, poultry, fruit, and vegetables in an unwholesome state and unfit for the food of man. In the framing of this clause there was some question as to the propriety of including in it all articles of food so adulterated as to be injurious to health; but it was ultimately considered that adulteration was of a distinct character, and ought to be dealt with separately. The inspector of nuisances, under the Nuisances Removal Act, might, in some cases, perform useful service in bringing under the notice of any authority that might be constituted the existence of adulteration in certain articles; but the great majority of the adulterations practised are of such a kind as would altogether escape his detection. In the case of the obvious colouring of bottled fruit and vegetables with copper, and again in articles of sugar and confectionery, he might render good service by forwarding samples to the Central Board; so that some reference to the subject of injurious adulteration in that paragraph of the Act would tend to good.

In conjunction with Dr. Thompson of St. Thomas's Hospital I have made inquiries into the water of the Thames, and the water supplied by the different metropolitan water companies; that inquiry was set on foot owing to the outbreak of cholera last year, and had reference more particularly to that subject; at the same time there are many conclusions to be drawn from the examinations, of general interest, not bearing upon the cholera at all, but upon the question whether the present supply is pure or not. There is no immediate remedy for the present condition of the water, short of leaving off the source of supply altogether. It is very bad after filtration; much improved, but still exceedingly bad. Any improvement which involves the having recourse to a different source of supply is strenuously opposed by the present water companies. I think the facts elicited in regard to the late outbreak of cholera are sufficiently strong to warrant the conclusion that a bad state of water materially aggravates the epidemic, if it does not give rise to it. The opinion of some is, that the water is essentially connected with the origin and propagation of cholera. Many of the waters at present supplied could be rendered more wholesome if they were subjected to sufficient filtration, and if they were contained in covered reservoirs, and not in open receptacles exposed to the air and the light. All the water hereafter supplied by the companies will have to be supplied filtered, and to be stored in covered reservoirs. There will be some gain to the public, but I do not believe that the water, under the provisions of that Act, will be in a satisfactory state. It is to be taken from above Thames Ditton; but it will not be free from all the objections which are raised against the present supply. The water will still contain a great variety of living organic productions, and some of them even after the methods of filtration which have been hitherto adopted. The water supplied from the River Lea and by the New River Company abounds with organic productions; hitherto the latter Company have not supplied filtered water, but they will have to do so shortly. They supply water merely purified, as the phrase goes, by subsidence; that is, the water is allowed to rest in large reservoirs, and any heavy matter falls down as sediment.

It has been suggested that the inspectors under the Nuisances Removal Bill would be available for the purpose of detecting adulterations, but the ordinary duty of an inspector of nuisances is of a very onerous kind; and if they were to discharge them efficiently, they would have very little time to devote to adulterations. There are already inspectors who ought to have a special knowledge of adulteration; I mean the detective inspectors in connexion with the Excise: they are scattered throughout the country; at all events, they are in all the ports, and in all the manufacturing and populous towns of the country: their services would be invaluable; in fact, the detection of adulteration is their exclusive business and occupation. Their duties at present are confined to articles of Excise. The duties of the inspectors I propose should be to keep a watch upon all articles, and judge as far as they could whether they are adulterated or not; and that when they have a suspicion, or even without a suspicion, they should make purchases in the neighbourhoods for which they are appointed, put the date upon them, and the address of the person from whom the purchases were made, and forward them to the Central Board, for their opinion whether they were adulterated or not. Though appointed in connexion with a town of some size and importance, they should have a district assigned to them in connexion therewith, embracing the villages and smaller towns, to which they would pay occasional visits. It would be desirable that they should have a certain amount of scientific knowledge, but if they were intelligent and trustworthy men, capable of acting under the instructions of the Central Board, that would be all that would be required; they would never have to pronounce upon the fact of adulteration; that would all come from a higher authority. In the case of a great many adulterated articles, they are sent from the large houses in London, or the large towns all over the country. It would be very desirable that an inducement should be given to the retailer to make known from whom he purchased the articles, and the state in which he purchased them. If the retailer were made responsible, he would examine the articles, or cause them to be examined, before he sold them; but I would draw a distinction between the mere seller of an adulterated article and the man who adulterated it, because it may be that a person with a perfectly good intention may sell an adulterated article. A large proportion of the adulterations discovered are in articles of necessary and daily use. The great evil of adulteration is, that it presses with tenfold greater weight upon the poorer classes than upon the rich; the higher class of shops being able to demand a high price, they can afford to sell a genuine thing, and they put themselves out of the way to get a genuine article. The poor man cannot change his tradesman as the rich man in a large town can. He has no means of testing the article himself, but is dependent upon the tradesman. An inspector who could penetrate into the villages would be a great protection to the poor.

In the case of drugs, I think the importation should be watched over. I would punish the adulterator in that case by refusing to receive the article consigned, and sending it back to him; that would be necessary in the worst cases. Some articles would be increased in price if they were sold pure, but when they undergo an increase in consequence of being pure, it will generally be found that they will go further in use, so that the increase in price is not a *loss; it* is made up in the quality. In sugar confectionery, for example: a genuine article, without attempting to attract the eye, would not be sold at the price that some adulterated sugar confectionery is. The loss falls upon the consumer in general. The seller is enabled to obtain a profit which he is not fairly entitled to; and though the purchaser may get it in some cases a little cheaper than if it were not adulterated, the greater part of the difference is pocketed by the seller. In the case of tea, it would be necessary to cause some notification to be issued *to* the Chinese authorities, that teas artificially coloured would not be received after a time, and from the first rejecting some of the worst qualities. With regard to drugs, if an Excise duty be levied, we have reason to presume that some examination would take place; but if we may judge of the proceedings of the Excise from any publication which is made, I should say they seldom take any notice. In the United States, they have an examination of all drugs which are imported into the country, and in the event of their being found to be adulterated, they are sent back, and not allowed to be admitted; and the inspector reports most favourably of the working of the system. There are also laws with respect to adulteration of a very stringent character in Prussia. I have an extract from the Prussian law which defines what is considered to be adulteration, and the penalties, which are of a very stringent nature. In France there are regulations of a stringent character bearing upon adulteration; and as to certain articles there are such regulations in many continental states; as to milk, for example.

EVIDENCE OF ROBERT WARINGTON, Esq.

I AM chemical operator and resident director of the Apothecaries Company. From my connection with that company, my attention has been a good deal devoted to the consideration of adulteration, and especially in the article of drugs. I work there as a professional chemist, and I have continually adulterations brought to me to examine. I examined *tea* some years back, in 1844, rather accidentally than otherwise; I was drawn into the examination more as a point of chemical interest; two samples of green and black tea were brought to me by an Excise officer, who had made a preliminary seizure at Kennington; he wished to know if those were genuine. I requested him to get further information as to the identification of the samples with the bulk, and he was to see me again. He never, however, called again. The samples lay upon the table before the window, and one day seeing the sunlight upon the surface of the green tea, I was very much surprised with the varying tints. I then examined it microscopically, and found the whole was faced with a colouring material. It consisted of Prussian blue, turmeric, and a white material which seemed to be a mixture of soapstone with sulphate of lime. I then made a number of inquiries among the influential men in the trade, and at the East India House, to ascertain whether this was done before it came into this country, or here. I obtained a number of samples, which I examined. On calling on one of the large tea warehouses and mentioning what I had observed, they said immediately, "Have you examined the unglazed tea?" I asked them what they meant. They said, "We have two kinds of tea in the trade, what is called glazed tea and unglazed tea." I said I had not, but I should like to see a sample of unglazed tea. They then showed me a sample which had no green colour at all; it was of a dull slate colour. On examining that I found no turmeric, and a very small quantity of Prussian blue; there was still a quantity of sulphate of lime upon the surface. This was as it was imported. Here is a sample of tea supplied under the East India Company's charter: there is a very slight glazing upon that. It was glazed at Canton, by the Chinese. The glazing is employed merely to make it more attractive to the eye, I believe. The sulphate of lime, I believe, is to make it stand the sea voyage, rather than anything else. The difference between green and black tea arises from the way in which the tea is cured. The black tea undergoes a fermentation; they cannot dry it black unless it has undergone that process. They very often make green and black tea from the same plant; if we take a plant which is rich in nitrogen, and allow it to ferment a little, if we attempt to dry that, it dries brown or black, but if we dry it immediately it is gathered *it* dries green. Prussian blue is used very frequently for damaged teas, or to suit the eye of the merchant who purchases. The American teas are much higher glazed than ours are. Mr. Reeves, who was one of the company's inspectors, says:—"The colouring is not intended as an adulteration; it is given to suit the capricious taste of the foreign buyers, who judge of an article used as a drink by the eye instead of the palate. You well know how little the London dealers even now like the yellowish appearance of uncoloured green tea. The Americans, a few years since, carried the dislike even further than the English, and therefore the Chinese merchant had scarcely a chance of selling his tea unless he gave it a 'face' that would suit their fancy. The small quantity of colouring matter used must preclude the idea of adulteration as a matter of profit." Prussian blue is not injurious to health. I think it is a very insoluble substance. Turmeric and sulphate of lime are also inoffensive. Some of the highly glazed teas might have an injurious tendency; it is quite a medical question, but I should think it would depend upon the state of the stomach and the organisation of the person. Glazing is a finishing operation, and anything can be glazed. The lie teas are glazed; they contain very little tea indeed. They contain about 50 per cent. of earthy matter. The term "lie tea" is used by the Chinese; they mean by that that it is false tea. This tea is imported into this country as lie tea by the merchant, but not beyond the merchant. These samples were put into my hands for examination by a merchant in London, in order to stop the introduction of these teas here. He sent back an analysis of the examination to Canton, and had it published in the papers there. It is known in the trade as lie tea. The brokers know them as lie teas. There was an immense quantity imported, and they endeavoured to import it as manufactured goods, so as not to pay the tea duty; but the Customs would not allow that. The wholesale trader knows very well what the meaning of lie tea is, but what name he gives it after he has imported it I cannot tell. Lie gunpowder tea contains 37 or 40 per cent. of earthy matter. The rest consists of colouring matter and tea-dust—the sweepings of the floors in which the tea has been cured. I believe lie teas are not now imported in very large quantities, but they were so formerly. I understood there was a quantity of them in bond at Liverpool, but the Customs would not allow them to pass unless they paid the tea duty; then the consequence would be that they would re-export them to some colony or place where they could sell them. When the company had a monopoly of the supply, and there was an *ad valorem* duty, they had inspectors at Canton, and I think we had purer teas at that time than we have had since the trade was thrown open. There was no lie tea imported at that time, that I have heard of; I believe it is quite a modern introduction, since the demand for a cheaper article. If an inspector were trained for the purpose of investigating such cases, he could easily ascertain whether a sample of tea were really tea or not, so as to enable any poor man to take his tea to him, and obtain a report from him on the subject. If you pour boiling water upon this lie tea it falls to pieces at once; the gum which unites the materials is dissolved, and the thing is reduced to powder. The colouring the material over a lamp would also detect the adulteration. There are also leaves which are rolled up in the form of tea which come from China, which are not tea at all. They do not use that for their own consumption, and they never touch those glazed teas in China, I understand. Tea is an article of general consumption among the Chinese, but the poorest people never drink those adulterated teas, and of course not the lie tea. Lie tea is mixed by the merchant at Canton, or at the Chinese port, with genuine teas, and sent over. Some of the mixtures containing lie teas contain from 11 per cent. of earthy matter to 24½, whereas the lie teas contain 40 per cent. of earthy matter. The greater part of the adulteration of tea takes place before it comes to this country. There was a place at Manchester where tea-leaves and other leaves were collected and coloured in imitation of green tea; I procured one sample, but I had very great difficulty in getting it, and soon after that I understood the manufactory had stopped altogether. All my samples were taken from merchants and brokers, none came from the retailers; in fact they all came from parties who were aware of the adulteration.

I have also some evidence to give upon the subject of the adulteration of drugs. The adulteration of drugs do not often come under our notice, because we buy the best quality in the market, and everything is ground and prepared on our own premises, but I am aware that there are great adulterations practised. If a drug is adulterated abroad we cannot prevent that; we take the best the market will afford; we cannot go beyond that. No cake of opium, for instance, is absolutely pure, because the juice which is obtained from the poppy will only dry to a certain consistence, and then they take some of the leaves which grow in the district, and they bring it into a cohesive state by putting in a quantity of those leaves. That is to a certain extent an adulteration; but it is a matter of necessity. We test all the articles we buy in the market, and we find that some which are imported are not pure, but are to a great extent adulterated; for example, with regard to scammony, its price in the market is one great criterion of its purity; scammony varies from 5s. to 40s. per lb.; opium varies from 7s. to 18s. per lb.; many of these opiums contain no morphia at all, which is the active principle of opium. Opium which has no morphia in it produces a violent effect upon the brain, from the quantity of narcotine which is in it; the true sedative quality does not exist in any large quantity in the Egyptian opium. We should never buy such opium. We know pretty well what the average per-centage of morphia is in the best kinds of opium. We buy the most genuine article which comes to the London market, irrespective of price, and we test it before buying. The system of buying is this: every Saturday a list is suspended in the outer part of the counting-house, for the whole trade; the drug brokers, or merchants, or importers, of the things which we wish to buy the following week. Before one o'clock in the day any one who wishes to send samples sends in those samples. There is a Buying Committee, attended by the principal chemical officers and myself, and a number of medical gentlemen. Those samples are all laid out; they are tested, and the best of them selected. We have a standard beneath which we would not purchase opium; and irrespective of that, we make a preparation to purify it, and to make it always of a constant quality; the soluble portion of the opium is dissolved, and the insoluble portion filtered away, and it is brought again to the state of extract; so that a physician ordering a prescription containing opium, if that opium were purchased at Apothecaries' Hall, could tell, with more or less certainty, what the effect of the prescription would be, with very great accuracy indeed. We perform this system of rectification upon all the drugs we buy. Any party may have the article either in its crude or purified state. We generally grind our own drugs. We were forced to do so by the fact of adulteration. Even if we sent a man to the drug mill to superintend the grinding of our own drugs, he was taken down to dinner, or to lunch, or to something of the kind, and all kinds of tricks were played. The process we adopt to ascertain the genuineness of the samples sent to us is a chemical or microscopical examination. In the case of arrowroot, for example, we select first all the best samples in point of appearance, and they are tested by the microscope, and the strength of the jelly each one will make is compared with the others. Besides the Buying Committee, we have an Inspecting Committee, no individual of which is a member of the Buying Committee, to inspect the bulk as compared with the samples, to see that they are equal; if any article is not equal, it is rejected at once. The Apothecaries' Society has no power to enter the premises of chemists and druggists. I believe the corporation have a power of visiting medical practitioners; that is, apothecaries' shops. We have two bodies in the Apothecaries' Company; there is the Corporation, and there is the Joint Stock formed from among the members of the Corporation. It is the Joint Stock which constitutes the trading department. The Corporation have the power of examining medical practitioners, and have nothing to do with the trade. They have not done so, however, for some years; there was so much resistance to it. The College of Physicians have the power of visiting the shops of chemists and druggists, and I believe they make every year a sort of inspection, but it must be very cursory; it is only one period of the year in which it is done; they always come round to our establishment. I do not think the exercise of that power has tended in any way to diminish the adulteration of drugs; it is not sufficiently active. Our establishments are open to inspection from the army and the Admiralty. As to the Admiralty, instead of there being an inspection of the orders which are put up, the whole establishment is under inspection *continually*. They have never done it while I have been there, but it is a part of the agreement between the society and the Admiralty that they shall be open at any period for inspection. We supply the whole of the drugs for the navy, and I think at the present time one-half for the army, and the whole for the East India Company. I think Messrs. Savory supply the other half to the army. Our prices are higher than those of retail druggists; but I think the profits of the society are much less than those of any ordinary establishment. The higher price is due to the superior quality of the drugs. In buying rhubarb, for instance, we have every piece of rhubarb cut through the middle to see that it is sound, and the same with opium. Turkey rhubarb, or that which purports to be Turkey rhubarb, is manufactured very largely in this country, and sold as Turkey rhubarb. I know, in the neighbourhood of Banbury, there is a grower who vends upwards of 20 tons of English rhubarb in a year to wholesale druggists. It fetches about 4d. a pound; the best Russian rhubarb fetches 11s. 6d. English rhubarb has a medicinal effect, but it must be a most enormous dose to produce any useful effect. It is not injurious; I believe at some of the hospitals they have used it. Turkey rhubarb is not grown in Turkey; it is a monopoly of the

Russian Government; and is grown in the Tartar districts; there are only a certain number of chests allowed to be sent to St. Petersburgh. We get no rhubarb from Turkey; from China we get large quantities. The price of the China rhubarb, which is commonly called Turkey rhubarb, is about 7s. 6d. Many druggists profess to sell drugs from Apothecaries' Hall, but we supply very few indeed. We have taken no proceedings against those who profess to be supplied by us, but are not. In cases of fraud which may be carried on under our name, by persons saying that they are supplied with their drugs from us, when they are not, we should be justified in interfering, and seeking to punish the parties; but it has not been done. It sometimes happens that people will purchase one or two articles from us, and then say they get their medicines from Apothecaries Hall. We should find it very difficult to convict in such cases.

We purchase a good deal of *arrowroot*. The price varies from 3d. a pound to 1s. 6d., but they are all true arrowroots; you have Jamaica and African arrowroot, at 3d. a pound. Potato flour, said to be used for the purpose of adulterating arrowroot, is as clean as African arrowroot. Arrowroot consisting entirely of potato flour would not form so good a jelly, nor would it be so palatable; the low descriptions of arrowroot are very inferior things indeed; they are dark in colour, and bad in flavour.

We do not supply the government stores by contract. In the case of the navy, we make a tender of prices every three or six months at their option; at the present time it is for six months; when that expires we send in the list again, with the prices which we shall charge for the next half year. The prices vary according to the state of the market. In the case of the army we do not furnish any list of prices, but we supply them at the market prices of the day.

We deal in *cod liver oil* very largely. That is an article which is very largely adulterated. We have an agent in Newfoundland, and we take the whole of his make; he contracts for the livers with the fishermen, and the oil comes direct to us. We know that even in Newfoundland the livers of all kinds of fish are taken, and the oil comes over as cod liver oil. It varies very much in price;

Norway oil may be equal to Newfoundland oil; if the fish are in as healthy a state, there is no reason why they should not yield as good oil. It is of a different colour, the livers having been allowed to putrefy to some extent. Cod liver oil is adulterated with all kinds of oily materials; in some cases it is not cod liver oil, at all. The adulteration is exceedingly difficult to detect. There are certain tests which have been published as tests for cod liver oil, but if there is five per cent. in the specimen, it will yield the same indications to those tests. It is entirely a question of confidence therefore.

I had several specimens of *mustard* through my hands some short time back. Some of those samples contained from 27 to 30 per cent. of inorganic matter—sulphate of lime principally; the genuine mustard yielding from 4½ to 6½ per cent., so that the difference would be very great. *Isinglasses* have been very much adulterated with ordinary gelatines. *Quinine* is sometimes very largely adulterated. We have sent out enormous quantities to the Crimea, and to the East Indies we send a very large quantity.

Chloroform is sometimes adulterated, but there are three or four makers who make perfectly pure chloroform. The price has come down very much of late; we do not consider chloroform a dear article now; it is made in such large quantities, and made so well, that there is not so much opening for adulteration. There would be peculiar danger attending the adulteration of chloroform. Even in the case of genuine chloroform there is danger if it has been kept a long time; it undergoes decomposition by the reaction of the elements on each other; if it is exposed to the sunlight for a few hours it would contain muriatic acid; the elements would react upon each other, and it would become a dangerous material; it should always be washed with water before it is administered. Its failure sometimes in operations is occasioned not so much by adulteration, I think, as by the action of the elements on each other, and the formation of muriatic acid.

EVIDENCE OF ALPHONSE NORMANDY, Esq., M.D.

I AM a physician, but I do not practise; I am a professional chemist. I have published a work on the subject of chemical analysis, containing the results of about ten years' investigation; I have examined bread, flour, tea and coffee, milk, cocoa, gin, and a host of substances. I have examined *bread* and *flour* to a very considerable extent. The adulterations of bread and flour are very much the same, and consist principally in the introduction of alum; alum seems to be almost the exclusive adulteration of bread and flour; the introduction of alum is sometimes to a considerable extent; I have actually found in bread alum which had been so badly and carelessly mixed as to be found in crystals of the size of a large pea. In the bread of a baker in the Church-road I found actual crystals of alum; I went to him, and showed him his bread, and he said, "I cannot help it." I said "Are you not afraid of being prosecuted?" and he used a very offensive expression about my eyes, and I vanished from his shop. The object of the use of alum in bread is this: it has the property of imparting to bread made of flour of second or third-rate quality a whiteness which otherwise you could not obtain except in bread of the first quality; besides this, what is much more important to the baker is, that it enables him to force into his bread a larger quantity of water than he could otherwise do; the alum imparts to bread the property of retaining that water, after it is taken from the oven. I find that the amount of alum varies from 500 grains, which I had found in the case of which I was speaking, in the 4lb. loaf, to 250 grains in the pound; frequently 25 to 30 grains in the pound; and more frequently still considerably smaller quantities than that. These are rather extreme cases, and generally it does not amount to more than two or three grains in the pound. I may say that, so far as I know, there is not a single baker in London who makes bread without alum. I once thought I had found a Phœnix—one who did not use alum; it was Mr. Gilbertson, of Judd-street; and as I went to reside in the neighbourhood about four years ago, I re-examined the bread at the same shop, and I found alum in it;

I thought it was due to him to inform him that his bread, which I had formerly analysed, and in which I had not found alum, now contained it; and his answer was, "If Dr. Normandy does not like my bread, why does he purchase it?" Alum is an astringent, and we must take into consideration not only the actual quantity which is contained in the bread, but the repeated and continuous doses which are taken day after day, till eventually you create a disordered and dyspeptic condition of the stomach. The poor man, particularly, who does not buy the best of bread, but the second quality of bread, instead of finding in it the nourishment which he pays for, gets, on the contrary, an enfeebled power of digestion, and consequently an inferior power of performing work; and he becomes, doubtless through that cause, and through the adulterations of other food, permanently enfeebled, and eventually he goes to the workhouse. To children the mischief is still greater than to adults. I find also that boiled rice is occasionally used in bread. I took some trouble last year to examine some patent which was brought out at the Marylebone workhouse for making bread, and I found that it consisted in simply introducing into bread a large quantity of boiled rice; rice is a wholesome food, but the effect was to introduce into the bread an enormous quantity of water. According to the process of manufacturing bread in France it is exceedingly difficult to defraud. When bread is adulterated in France, which occasionally is the case, the baker is at once summoned before the police correctional; if it is the first offence he is fined, or if the offence has been very gross he is shut up for a week or ten days, or something of that kind; and if the offence is repeated he is prevented from establishing himself again as a master baker; he can work as a journeyman baker, but he can no longer establish himself as a master baker, and the sentence is placarded about the town; in fact he is a ruined man. In France there is an assize of bread, and no man can be a baker without permission, and also without depositing in the public granaries a certain number of sacks of flour, which he is obliged to keep there. That was a regulation established at the time of the great revolution. The laws in operation in France have the effect of checking the adulteration of bread; of course there are people who, notwithstanding these restrictions, will commit a fraud, but they are generally very soon detected; and I believe, practically speaking, bread is not adulterated in France; it certainly is not nearly so much as it is in this country. In 1847 I found in three quantities of bread which I examined in London, some carbonate of magnesia. The object of that adulteration, I believe, was to gain weight. I belive also it may have been used to correct the acidity of flour which may have been damaged. In 1847 I also found chalk in one sample of bread. I never found plaster; clay I found once. This clay must have been put in evidently for the sake of weight, for it has no power of counteracting any acidity, or anything of that kind. Potato starch I never found in bread. Something must be said in respect to potato starch, and it is this, that though I did not find potato starch in bread, I know that potato pulp is used in bread, and owing to this a few potato granules are occasionally detected under the microscope. When you come to examine bread in this way, you find it has quite a different character, because the starch having been exposed to the heat of the oven, the granules have burst, and the ordinary character, the peculiar oyster-shell form, of potato starch is completely obliterated. You see that torn granules are here and there present. I believe that it is not introduced for the sake of adulteration. When a baker makes bread he takes a certain quantity of yeast and of flour, and a certain quantity of mashed potatoes. I believe potatoes are introduced merely as an adjunct to increase the quantity of yeast, so to speak, but the quantity is so exceedingly small that I am sure it cannot be looked on in the light of an adulteration, and it is not injurious. If instead of mashed potato you use potato starch, you obtain a loaf which is perfectly unpalatable; it has an earthy disagreeable flavour. I am sure that potato starch could not be used in the process. I have requested a very intelligent baker to make bread for me with various per centages of potato starch, which I directed him to use. If two or three per cent. of potato starch is introduced, you obtain an ill-shaped, ill-looking bread, a loaf which nobody would like to buy, and it has that peculiar earthy flavour which potato starch develops when water is poured upon it. Bakers' stuff, or bakers' salt as it is called, is salt mixed with alum, and sometimes you may consider it alum mixed with salt, the proportion of alum being more considerable than that of salt. Sulphate of copper has been said to be used in bread, but I never found it in this country. I am aware that it has been used in Belgium, but I should say that I have examined 150 samples of bread taken from various parts of the metropolis, and I never found any copper in the bread.

In *flour* I have found alum and water. Water exists in flour which is not generally put there on purpose; the millers, on the contrary, strive to prevent water from getting into their flour, because if the flour is put into a damp place it will absorb from 14 to 18 per cent. of water, and then it is liable to clot or cake together, and shortly afterwards a fermentation is set up, in consequence of which the gluten is destroyed; the flour acquires a musty odour, and it is altogether spoilt. Therefore, when any tendency is observed in the flour to this condition, the sacks are immediately rolled on the floor, and spread, so as to break all these clots. It would be a serious loss to the miller if water should get into his flour; yet, nevertheless, we find flour damaged by a large quantity of water being present. It is not, however, an adulteration, because an adulteration presupposes that a man is intending to use it as a means of fraud for a particular purpose, whereas the flour becomes damaged in spite of his endeavours to prevent it; but, then, when, in spite of his endeavours, anything of that kind has taken place, he begins to remedy it by adding alum for the purpose of counteracting it. There is a double adulteration; the miller frequently adulterates his flour with alum, and the baker again adulterates it by putting a little more, so that the flour, as it comes from the baker, is liable to a second adulteration. The presence of alum is more or less the consequence of the baker's adulteration; and yet, in all the flour I have examined from the corn-chandlers, I have rarely found a flour which did not contain alum to some extent. I have generally examined that which was purchased at low shops in preference to the better shops, my endeavour being to find out how the poor were treated, knowing perfectly well that the rich are more protected. In the first place, they have more refined habits, and are therefore more liable to detect from the taste that the article which has been adulterated is not that which they are accustomed to eat or to drink. Flour is always adulterated in the poorer class of shops; and bread, even in the highest quarters, is always adulterated. I never found a sample of bread without alum. I discovered the meal of beans and peas in flour—in 1847 and 1848; I believe those were years of scarcity, and I hardly think it would be right to look at that as a general practice; it is an exceptional adulteration. There is nothing so easy as discovering the adulteration; you have only to wash the flour or bread, crumbled into powder, with water, squeeze it through a coarse piece of muslin, add a little muriatic acid to it, filter it, and if the filtrate yields a precipitate when tested with carbonate of ammonia, it is alumina, which falls down; if, when tested with chloride of barium, there is a precipitate, you have the two elements of alum; by the first filtrate with carbonate of ammonia, you obtain a precipitate of alumina; if you obtain with chloride of barium a precipitate, there is an indication of sulphuric acid, and it is evident that alum is in the bread. If in districts or parishes there were inspectors, men of acknowledged probity or capacity who were appointed to receive complaints, the public would be immensely benefited. I am sure among chemists there are plenty of men of character and probity who would be glad to do it as a matter of public duty. But I think ordinary chemists know nothing about chemistry. There is nothing so common in England as the name of chemist, and there is really almost nothing so rare as a chemist. They are rather sellers of drugs than chemists; many of them have not the slightest knowledge of chemistry.

The principal adulterations I have found in *tea* I will state, omitting all reference to those which I have not myself discovered. I have found, occasionally, magnesia and Prussian blue, and silicate of magnesia, in green tea. This I know to be the case, not only because I have found it, but also because I have seen it put into the tea. A large tea dealer (and it is surprising to see how the most respectable men will sometimes do that which is not right), met me in Fenchurch-street, and he said, "Doctor, I want you to come and see what beautiful seams the tea chests are closed with." The tea chest as it comes from the warehouse is closed, and there is only a hole cut about the size of the hand, for the purpose of taking out a sample. He showed me a seam of the cover, which was a very beautiful sheet of lead, exceedingly thin. It appears that great endeavours had been made to open the chests, for the purpose of making suitable mixtures, and to repack them, and make that beautiful seam which the Chinese make, and it appeared that application having been made to many of the tinsmiths in this country they could not reproduce that seam; that is to say, in attempting to resolder it they melted the lead, and the operation was spoilt. I saw a room, which was perfectly clean, boarded with very clean boards, and it had heaps of teas piled up against the wall, and there was a rope against the wall, which served the following purpose. It appears that the chests are only permitted to be cut open sufficiently to put the hand in and take a sample, and it is through this hole the whole of the chest is emptied on the floor. A mixture is made on the floor with teas of a very inferior quality; some of which I have examined, which yield an infusion with about as much taste as an infusion of brown paper. This is thrown upon the floor and mixed with magnesia and Prussian blue; and then the question comes, how they can reintroduce it into the original chest from which it was taken; and it is done in this way: a small quantity of tea is put in the chest; a man puts his foot upon the hole, grasps the rope, and by a series of jerks he succeeds in packing it up tight, and so he goes on with another layer, and the pounding process is repeated till the chest is eventually filled up as tight as if it had not been touched. This I know from personal observation, and I understood that all persons do it; so that a man who buys a chest of tea is under a great delusion if he thinks he is secure from fraud. What induces me to think that the practice is pretty general is, that I know of another merchant whose servant was turned away in consequence of an affair about some magnesia which he had bought and had not paid for, or something of that kind. Besides that, I should say I have found from actual examination magnesia and Prussian blue in tea. Magnesia gives it a blue tint, and the fine Venetian talc gives a glossy appearance. I should say 500 grains of tea would yield 27 grains of ashes by incineration. There is an article which of late years has also been sold for adulterating tea, and that is called *veno-beno*. I find that this article consists of 90 per cent. of catechu. The remaining 10 per cent., or thereabouts, appeared to me to be a tea-powder. On examination under the microscope I found the appearance of broken tea-leaves. I am aware that other chemists who have examined this adulteration after me have supposed that these vegetable powders consisted of other leaves, such as sloe-leaves, but I am myself satisfied that what I examined were broken tea-leaves; tea-powder, in fact. The cost of these ingredients, compared with the cost of tea, is very small. I should consider veno beno to be no further deleterious than as any strong astringent might be so. In respect of the Prussian blue and magnesia, I am satisfied the adulteration is by the tea merchant. I know from personal experience that adulteration was practised by one of the largest retail tea merchants in this country.

FRIDAY, July 20th, 1855.

EVIDENCE OF ALPHONSE NORMANDY,—continued.

I omitted to call the attention of the Committee to a certain description of bread which goes by the name of *unfermented bread*, which is made by mixing flour with a certain quantity of diluted muriatic acid, and another portion of flour with a certain quantity of bi-carbonate of soda, in such proportions that the one will neutralise the other; the result being the production of common salt. This cannot be put in the shape of an adulteration, but there is considerable danger attending the manufacture of bread in that way. There is on record a case which terminated fatally from a person having used such bread. Muriatic acid generally contains arsenic; it is, in fact, the most frequent impurity in muriatic acid; the consequence is, that if you take bread raised artificially by muriatic acid, the quantity of arsenic which was contained originally as an impurity in the muriatic acid will be transferred to the bread, and I need not allude further to the consequence of that. Occasionally the muriatic acid has been replaced by tartaric acid; that is the common mode; but whatever mode may be applied we should deprecate the use of chemical re-agents at all times for the purpose of being introduced into articles of food; chemical substances are very seldom pure, and should never be permitted to be introduced or used with articles of food. The use of muriatic acid and carbonate of soda in this manner is injurious; besides that, it makes a bread which is deficient in a great many qualities; it will not make a poultice, it will not toast, it is perfectly inabsorbent, and it is indigestible, notwithstanding what has been said by medical practitioners, who are not quite conversant, perhaps, with chemical matters, that not being exactly their profession. It was supposed that the bread would be more nutritious, because the sugar of the flour was left in; that is to say, ordinary fermentation is always due to the conversion of the sugar in the flour into carbonic acid; that is one of the products of fermentation. I only wish to allude to it, not as an adulteration, but as a dangerous practice; it is always sold and advertised as unfermented bread, but it is not commonly used; still I see it sometimes marked up.

Cocoa and *chocolate*, I believe, are articles of food which are the most adulterated. Chocolate, which should be a mixture of sugar and *fecula*, or arrowroot, is generally mixed with brick-dust. Sometimes I have found as much as 12 per cent. of ochre. I have found 22 per cent. of peroxide of iron; it is very frequently adulterated with animal fats, and those frequently of the very worst description; rancid tallow, for example. It is not at all necessary to mix anything with the cocoa and sugar, in order to give it consistency. Cocoa ground *per se* in hot mills, or on iron plates, will, on solidifying, form a perfectly hard mass; but then there is this to be said, that the pure cocoa contains a somewhat solid oil which is called butter of cocoa, which does not agree very well with some persons, while if it is combined with a certain portion of arrowroot, it is more easy to be digested. This butter of cocoa is frequently extracted from the cocoa, being used as a medical preparation, and then, in order to replace it, tallow is used. The adulterations are principally practised upon the preparations of cocoa, either powder or chocolate; I examined some cocoa powder about two months ago, which I found adulterated to a very great extent. The cocoa nibs are not adulterated, but very frequently the nibs are interspersed or mixed up with nibs of musty cocoa; one does not exactly detect the admixture till it is ground, and hot water is poured upon it; then a musty odour comes up, which is sometimes offensive. That is a fraud; and so is brick dust, and oil, and peroxide of iron, and ground shell, and ground biscuit, which I have found in cocoa myself. In this evidence I say nothing from mere hearsay, but only of what I have found myself. Cocoa and bread are the articles I have most extensively examined. I am under the mark in saying that I have examined at least 150 samples of bread, and cocoa to the same extent. You may detect ground shells by the microscope, but the others are detected by burning a quantity of the cocoa. The adulteration of chocolate is done by the manufacturer. I do not conceive that it could be done in any other place. The article does not come to this country in the shape of chocolate, but in that of cocoa nibs; these are sold to the chocolate-makers, and they crush the cocoa, shell it, fine the shells away, and grind the cocoa with sugar and flour. I have not found red lead in chocolate; I know that has been stated, and, indeed, the statement will be found in all books which treat of the adulteration of food. Cocoa has increased as an article of consumption very much within the last ten years. Some of the articles used for adulteration, such as red ochre, are of no value, comparatively speaking. The only security for the public in the case of cocoa is that they should use the cocoa nibs. All those preparations of chocolate, or cocoa paste, or powder, are more or less adulterated. Unfortunately the cocoa nibs will not boil tender; they must be stewed a very long time, indeed; while a cup of chocolate, when properly made, is one of the most delicious and most nourishing beverages you can have; it contains everything that will sustain life and repair waste. As made in Spain and Italy it is a delicious beverage. If you attempt to make a cup of chocolate from the cocoa nibs, you would obtain a rather watery liquor, exceedingly pleasant to the taste, but not very nourishing, because it is only a very trifling quantity which will have dissolved, so that it is rather a drink than a food in that condition. Chocolate must be a mixture of arrowroot and sugar, and then boiling it for a few minutes will make a palatable and refreshing beverage. If the cocoa nibs be crushed and stewed twenty-four hours over a slow fire, it is a very nourishing food, but that gives a great deal of trouble. In fact it is that very trouble which the chocolate-maker intends to spare you; he crushes it for you, at least he should do so; if he were an honest dealer he should crush it, and sugar it for you, and mix it with a little arrowroot in order that the butter of cocoa should not prove indigestible or disagree with you; he takes all the trouble which you must take if you have the cocoa nibs. Those preparations are very general. I have taken samples promiscuously from different shops, large and small, and I am of opinion decidedly, that the adulteration takes place with the manufacturer. I conclude from that, that the retail dealer is imposed upon, because it is generally sold in packets which bear evidence of not having been opened; they are sold as they come from the manufacturers. Peroxide of iron would be injurious to some constitutions, but it would not have any direct chemical effect; it is a perfectly inert insoluble thing. The purchaser does not get nearly the value of his money; adulterated as it is he ought to get it much cheaper, so that in every way it is a great fraud. In my examination of cocoa I have met with old biscuits; I believe they were biscuits, but I have no means of speaking positively as to that fact; it was some farina baked very hard; it may have been crust of bread or something of the kind; I believe they were old biscuits. I have heard that acorns are collected and crushed, but I have no proof of it.

Coffee is an article which is very much adulterated; I have met with roasted corn to an extent of from 25 to 30 per cent.; it is recognised by the size and character of the starch granules; it consists of barley and rye, and it is generally very easy to detect; it floats up. If coffee has been adulterated with roasted grain, when you pour boiling water upon it, you will see rising against the sides of the cup portions of the ground grain, which you sometimes can separate in considerable quantities, by capillary attraction; if you pour such coffee from the coffee pot, some of those grains will fall with the liquid in the cup, and they will climb up, as it were, the sides of the cup, a quarter of an inch, or something of that kind, all round, and you can collect them very nicely. The other adulteration of coffee is chicory and parsnips or carrots, I hardly know which, for they are very much of the same character, and under the microscope present very much the same appearance as chicory. I have found from 50 to 75 per cent. of chicory, or something very much like that. Chicory is between 3d. and 4d. per pound; you cannot get coffee worth the name for less than 1s.; then there is the grinding, which is 2d.; so that a pound of coffee cannot be produced for less than 1s. 2d., exclusive of the grocer's profit. Therefore, if coffee is marked up at 1s. per pound, it is very clear something extraordinary must have taken place to enable the grocer to sell it at that price. Chicory is extensively used in France, but it is never sold as a mixture; of course, I speak generally, and not of isolated cases; I do not think the mixture is permitted by law to be kept. I understand that the customer or purchaser is frequently defrauded by a sort of legerdemain; while the whole coffee is being apparently ground before him, by a sleight of hand the grocer puts in a little chicory and grinds them up together. I have no doubt that the fraud is extensively practised in France, of supplying chicory instead of coffee, and I know that it is very much liked by the lower orders to drink with milk; but as to its being preferred for what is called coffee alone, it is a perfect mistake. I am certain no respectable coffee-house would get a customer if they sold *café noir* with chicory in it, because chicory gives a curious taste to the coffee, a sort of liquorice-like taste, which disappears when mixed with milk, and it gives to milk a more golden colour than coffee alone. Any Frenchman can detect when there is chicory in the coffee without milk. The great secret in making good coffee is to put enough coffee. Every person in France is in the habit of drinking coffee in large quantities; and the taste of the black coffee unadulterated with chicory is so different from coffee which is adulterated with chicory, that I am satisfied that a house which would attempt to sell coffee containing chicory would lose its custom. It is much less usual in France to buy coffee roasted and ground; all persons roast their own coffee; and the retailers roast every day the quantity of coffee they are likely to require during the day. It is a great mistake to keep coffee roasted or ground in large quantities. The facilities for fraud are not the same in France owing to the different usage of the people. Chicory is a slight demulcent; it has the medicinal property of mucilage of linseed. It is not injurious in itself; it is simply a fraud upon the public by being sold at the price of coffee. The largest quantity of chicory I have detected in coffee was 75 per cent. The common amount of adulteration ranges from 20 per cent. upwards. The most adulterated is that sold in canisters; it is extraordinary how such stuff can be bought except by persons who know nothing about coffee, for the very smell is sufficient to show that it contains chicory to a considerable extent; in fact, it overpowers the odour of the coffee; it has a peculiar odour which I cannot very well describe. The coffee containing 75 per cent was bought in one of the largest shops in the suburbs of London, somewhere about the Kingsland-road; a very large, and one would think a highly respectable shop, doing an immense business. Chicory colours water to an enormous extent, which is a good way of detecting the quantity. It is by the colour it imparts to tubes of glass filled with water, and by comparing it with the colour of known mixtures, you ascertain the extent of adulteration. The retailers mix it themselves. When I was beginning these investigations I was foolish enough to go to the parties occasionally, and tell them, "Really this is very bad;" but generally they abused me, and therefore I gave up the remonstrance. They began to use offensive language. I went to this person in the Kingsland-road; I said, "This is too bad; you are putting an enormous quantity of chicory in your coffee," and he said, "What is that to you," and began to speak offensively, and I left. I told him he was liable to a prosecution. I was not an informer. He had nothing to fear from me, but if some Excise officer were to ascertain the fact he might be prosecuted. Chicory is sold separately by the same parties who sell coffee; I have bought chicory separately at the same shop where I have obtained this mixture. They are now allowed to sell a mixture of chicory and coffee, unfortunately; I think it is very objectionable. They do not state the proportion on the label they put outside, so that you might have a teaspoonful of coffee, and all the rest chicory. That was the case with the specimen I have mentioned, but that was sold under the name of coffee, and not as a mixture. It was sold under the title of "Coffee as in France." Chicory is not injured by being roasted; it loses in this way, that instead of yielding a mucilage, when boiled with water, it yields a coloured liquid, which is not ropy or mucilaginous, as it otherwise would be. It has been alleged, that it enables ground coffee to be kept better; but it is perfectly false; that is the excuse which the seller alleges, but it is perfectly unfounded. The detection of chicory is so easy, when the proportion is at all large, that you can detect it without looking at it, merely by taking a pinch of the adulterated coffee and rolling it with your fingers. If it adheres, and you obtain a pellet, there is chicory, because with pure coffee you cannot do so. Chicory has a great affinity for water, and will knead into a clammy mass; coffee will not do so; so that, if you take a pinch of pure coffee ground, and attempt to knead it together, or roll it into a ball, you will not succeed in doing it; but if there is any chicory with it, the moisture of the finger, or if you have a dry hand, if you take a little saliva, and roll it in this way, you will obtain a pellet which will drop like a shot. In case you wished to impose a penalty, and sought for direct proof, the microscope gives perfect evidence. I believe a microscopist, that is to say, a person who has devoted his attention almost exclusively to microscopic examinations, would easily distinguish between parsnip or carrot and chicory, but I cannot very well do so myself; I have only used the microscope as an adjunct to chemical means of investigation; and yet, though I do not pretend to any extraordinary skill in the usage of the microscope, the character of chicory is so distinct, and the spiral vessels are so readily observed, that I can at once detect them without the slightest difficulty. With a very moderate amount of skill indeed you can at once detect that there is either chicory, or parsnips, or carrots; the only difficulty is in the detection of parsnip as distinguished from chicory; there is no difficulty in distinguishing chicory from coffee. I have never found anything injurious in coffee. It was stated by a former Chancellor of the Exchequer, in the year 1851, that four eminent persons had been employed to report upon this subject, but neither by chemical tests, nor in any other way, was there any certainty whether the mixture contained chicory or not. I do not know who the eminent persons were, but they must certainly never have looked at a sample of adulterated coffee through the microscope; from merely looking at it you at once see that chicory is present. I am not sure that whole coffee is free from adulteration. It is a question which I have not yet quite decided myself; I have occasionally met with whole coffee which appeared to be pure, and which on grinding turned out to be a very singular substance;

I cannot give evidence upon that because I do not know how it comes about as yet; but about a month ago I had a sample of that kind which is engaging my attention to ascertain what that can be due to. I have no doubt there is something sold which has the appearance of the coffee berry which is not coffee.

Chicory itself is extensively adulterated with brick dust and ochre. I have been informed that parsnip and carrot are extensively sold as chicory, but I hardly conceive that there would be a great profit in that; and as I cannot distinguish myself between parsnip and chicory, I am not prepared to give any evidence upon it. There is not much difference in the value; but there would be a great difference in the value between chicory and brick dust. Chicory is very frequently mixed with earthy matter and with charcoal; I have found 15 per cent. I am not aware that chicory is consumed alone, either by the poor or any portion of the community; I think it could hardly be so consumed; it would yield a very effete and vapid sort of infusion; by itself it has no aroma. It contains a little starch, and therefore it is nutritious to a certain extent. I am aware that it has been stated that beans and peas have been used for adulterating coffee, but I have not found any instance of it. I am told, also, that acorns have been used, but I have not myself seen any instance of that. The mixture of inferior coffees with the better kinds is a question of taste more than any other. I do not know whether that is practised. There is a good deal of musty coffee ground; coffee which has become musty in the hold of the ship: there is a great deal of coffee which, when you pound it and mix it with water, has quite a musty taste; that is so extensive, that a coffee-roaster in the metropolis took out a patent for disinfecting this coffee. The process is by passing a current of air through the roasting cylinder while the roasting is being carried on. In this way you get rid of the musty flavour which such coffees have; but then the gentleman forgot at the time that the same process which deprived the coffee of its musty odour, would also deprive good coffee of its aroma; so that if you ground good coffee, passing a stream of air through it while roasting, it would very materially deteriorate the quality. Another thing is this: in England, coffee-roasters are in the habit of emptying the cylinders in which they have roasted the coffee upon large hurdles, or sieves, supported upon an axis; there is a handle at each side, and a man moves it up and down in order to cool the coffee rapidly, but in doing that a great deal of the oil to which coffee owes its flavour is dissipated, and the coffee is materially injured. I have never met with any tan or oak bark in prepared chicory. It is true I did not look for it; therefore it may have been there and I may have missed it.

Beer is a liquid which is very largely adulterated, but I must say, as far as my knowledge goes, not in one single instance by the brewer. The adulteration takes place by the publicans, and to such an extent that there is actually a difference of 50 per cent. in the quantity of alcohol which the same beer contains when it comes from the brewery and when it is bought from the publican. I am speaking of that with very great certainty, because I have purchased porter from a certain brewer and I have purchased the same beer of a publican where the beer is retailed, and I was surprised to find that the quantity of alcohol was so enormously different. The beer is so greatly adulterated, that I have purchased the beer I consume from the brewery, and I have done that for the last five years. Lately I was out of beer, and I sent to a public-house for some, but I could not drink it; it was perfectly disgusting. The substances which can be detected as adulterating substances are only two; namely, common salt, which is used to a more considerable extent than it should be, but that is probably merely for increasing the thirst of the consumer; and sulphate of iron, by which I once suffered pretty severely. I was at Bermondsey, coming from examining a tanning factory; it was in the heat of summer, and I stepped into a public-house to take a glass of porter, and very soon after I was seized with violent colic and vomiting, and felt exceedingly uncomfortable; I drove home, and the symptoms disappeared very rapidly. The next day I returned to the same place with a bottle, and bought half-a-pint of beer at the same public-house, and then I found the presence of sulphate of iron, and I attributed, of course, to the presence of that poison, my indisposition. The effects of sulphate of iron are vomiting and colic; it is a true case of poisoning. It is mixed with beer for the purpose of producing a kind of metallic smartness, I presume, which the drinkers of that beverage like to find. There are many other substances with which beer is adulterated, but unfortunately they cannot be detected by chemical means.

say they are employed, because I have obtained evidence which appears to me to be perfectly conclusive. I obtained a letter of introduction to two of the largest druggists in London, and from them I heard that cocculus indicus, foots sugar, liquor ammonia, and extract of gentian, were constantly sold by them to publicans for the purpose of adulterating beer. Some years ago I saw, standing at the corner of a street near a public house, a cart, with the name of some person, "brewer's druggist," upon it; I think the inference is, if there be brewers' druggists there must be beer druggers. I inquired after those parties, but I find that lately they have completely disappeared. There are no longer any druggists following ostensibly the profession of adulterators of beer; still I find that certain people, generally decayed tradesmen in that line, go round to new public houses and sell to the publican a way of sophisticating his beer; or when his beer has required treatment for some cause or other, he is occasionally willing, at any rate, to buy the secrets of some of these persons, who, I understand, are very poor, and are glad to sell what they deal in for a very small sum. The two persons whom I got the information from did not personally know me, though they might have known me by name. What they told me was perfectly conclusive, because they gave similar accounts; they told me that they sold cocculus indicus to publicans, and that this cocculus indicus was used to replace the spirit which had, so to speak, vanished by dilution. Cocculus indicus is a poisonous substance; it contains about 2 per cent. of the poison called pitrotoxine; it is used, I understand, by poachers for destroying pheasants and fish. There is no doubt that this poisonous substance is occasionally used by brewers for the purpose of causing a species of inebriety which should be due to alcohol. It creates a feeling of intoxication without the previous excitement which alcohol produces; it knocks you down, so to speak, without previous exhilaration. That state of inebriation which is produced by cocculus indicus is more prejudicial than that which is produced by alcohol; for although alcohol produces intoxication, it does not disorganise except when taken in immoderate quantities; it does not act so fatally as poisons would act. When inebriation from alcohol is over, the bad effects disappear, and you return to your normal state; but a case of poison generally affects the organs more or less seriously;

and we should bear this in mind in investigations of this kind, that it is not so much the quantity as the introduction of a small dose every day; eventually it tells up, and impairs the health very much indeed. That would apply still more to sulphate of iron, but I do not think sulphate of iron is used very extensively. I have not been able to detect its presence more than two or three times. It is used for the purpose of supplying strength to the beer, which, I suppose, is wanting from the dilution with water. For the same reason they add a certain quantity of foots sugar, because by diluting the beer they have rendered it less sweet. By the addition of water, not only have they diminished its sweetness, but they have also diminished its colour; and they then put a little liquor ammonia, or spirits of hartshorn, which has the property of darkening beer, so much so, that if you add a little ammonia to pale ale, it will become the colour of porter. Instead of hops, extract of gentian is used. Gentian is not a deleterious substance; it is introduced merely because the beer has been diluted, and it is no longer so bitter as it should be, and therefore a *little* extract of gentian is introduced. Indeed, I am given to understand that the chief sale of gentian is to publicans. It is cheaper than hops. I have been able to discover the proportion of water there is in beer, by detecting the quantity of alcohol; you judge of the quantity of water added from the amount of alcohol which is wanting. There is no amount of alcohol which is required; the brewers are not bound to sell it at a certain strength, and therefore you have not the means of detecting how short it falls. I or any chemist can ascertain the quantity of water which has been added by determining the quantity of alcohol there should be. If I obtain beer from the brewers, from Messrs. Calvert, for example, I find that beer contains so much alcohol; but I find half that amount of alcohol in the beer sold by publicans who have Messrs. Calvert's name upon their signboard. The pure infusion of malt and hops is a very wholesome beverage; it is the wine of northern nations. But such articles as cocculus indicus and sulphate of iron must act very prejudicially upon the system; and beer, which is really an excellent beverage, is converted in this way into a means of producing disease. I do not know how any poor man could know whether his beer was adulterated or not; I could not know it myself except by determining the proportion of alcohol; there is no means of determining the quantity of cocculus indicus added. If brewers were bound to brew beer of a certain strength, that would afford a means of preventing adulteration. Some years ago there was a great cry about the introduction of strychnine into beer; at that time my yard was converted into a sort of beer cellar from the samples sent to me to ascertain if they were pure. Messrs. Allsopp, Messrs. Bass, and Messrs. Calvert, and others sent me samples of that sort. I could detect half a grain of strychnine in a gallon of beer, but I cannot ascertain the amount of cocculus indicus. I could detect sulphate of iron very readily; nothing is so easy. I do not know whether the officers of Excise ever detect those adulterations. They could detect sulphate of iron, but that is very seldom used. You may call that an exceptional case of adulteration. An Excise officer might perform the duty if properly instructed and supplied with an instrument, which has been constructed for the purpose, which tells the quantity of alcohol contained in any mixture by the temperature at which it boils. If you boil a quantity of alcohol in water you find the mercury is rising gradually in the thermometer, and there is a certain point at which the mercury will remain stationary for about half a minute without rising. That is the point which corresponds with the predetermined mixture of alcohol and water. By referring to the tables you can at once ascertain the result. I see no reason why the Excise officer, or some competent authority, should not detect this adulteration. Supposing adulterations were effectually stopped, the consumption of malt and hops would be very largely increased, and the revenue so far benefited: it would be increased 50 per cent. I have never detected nux vomica, but I feel inclined to think beer contains it; because, although I could not obtain such evidence as would enable me to say it exists, I obtained such as makes it exceedingly probable. I obtained with salt, coloured by chromate of potash, a colouring which was so very much like what is produced by strychnine, only less distinct and more dingy, that I feel inclined to think nux vomica is occasionally there. The effects are the same as those of cocculus indicus. I am restricting myself principally to porter, because I have not had so much experience in the testing of ale, except in those particular cases of which I was speaking, for the detection of strychnine. I have found nothing in ale but a deficiency in alcohol; but I may say that cocculus indicus, &c., which have been used in beer, may apply to ale; they have been given to me by those two druggists of whom I have been speaking, as being extensively used in the adulteration of beer, which probably includes both porter and ale, and as these substances cannot be detected by chemical analysis, I cannot speak as to their being there. I should suppose that there was the same motive for mixing water with ale as with porter, and then introducing these stupefying properties; only I may say I never found sulphate of iron in ale, and I have occasionally done so in porter. I cannot say that no adulteration takes place in the brewing of beer, but I really do not think it is possible; when you consider the number of people which surround a brewer, I think the public have the greatest security which they could possibly have. I have not detected any adulteration in beer as it comes from the brewer; I have found the beer from the brewers so exceedingly different from that of the publicans, that I have no doubt the adulteration is practised exclusively in the cellar of the publican. Quassia is a bitter substance; it would act very much like gentian; there is nothing deleterious in it; still it is not hops, and therefore is an adulteration. Adulteration, I take it, means this: the addition of a substance which does not impart to the article adulterated any quality whatever; for example, I do not call an adulteration the mixing of cotton with wool or with silk, because the result is an article which looks nearly as well, and which partakes of the qualities of the fabric which is made exclusively of wool or of silk. But if that article is sold as pure wool or as pure silk, it is a case of fraud, in my vocabulary. I think the fault in that case lies at the door of the vendor, but not at all at the door of the maker. In the same way, if what I understand by the manufacture of beer is the making of a certain beverage containing hops and a certain amount of alcohol—a certain well-known definite compound—if you introduce water, and add cocculus indicus and foots sugar for the purpose of sweetening, and liquor ammonia for the purpose of browning, it is a case both of adulteration and fraud. If these ingredients were advertised as being contained in a pot of porter, no one would drink the compound. The public believe that what the publicans sell them is composed of malt and hops, and therefore the introduction of other substances is an adulteration and a fraud; an adulteration, because you have introduced an article which confers no particular property, except that of poisoning, which you did not bargain for. You can brew from molasses, but that is not an adulteration; the sugar in that case is used for the purpose of producing alcohol; the sugar is intended to replace another form of sugar which exists in the malt; therefore you cannot call that an adulteration, even if it were not permitted by law; for the only difference between the one and the other is, that malt may be taken as a cheaper sort of sugar than molasses. But if you dilute with water, and replace the alcohol by cocculus indicus, then you are a fraudulent person; you are an adulterator and a poisoner.

There is another article of very large consumption, *gin*. This is an article upon the adulteration of which I can offer nothing but collateral evidence; that is, the same druggists who gave me the substances employed for adulterating beer, gave me a list of those which are employed for adulterating gin, brandy, and rum. Some of those, I may say, can be detected by chemical analysis. The articles used for adulterating gin are sub-carbonate of potash and alum; that is for fining. I have this information, I may say, in the handwriting of druggists themselves, and, in comparing the lists of the two parties, they were exactly similar. Alum can always be detected in gin. Oil of vitriol is also used, and oil of almonds; that is for beading—in pouring the gin into a glass it must form a series of little bubbles which hang on the periphery of the glass. Sulphuric acid can always be detected in gin. Then grains of paradise is used, which is a kind of pepper; it is a little reddish seed, about the size of small shot; it has a very peppery taste, and I understand it is used to replace the spirit, because the adulteration of gin is the dilution thereof. It is like beer; they use water, and then the object is to restore a portion of the taste and of the inebriating quality, for which they use cocculus indicus. I come to the same conclusion here that I do with reference to beer, namely, that gin is adulterated, not by the distiller, but by the publican. In the year 1829 there is a case on record of several men who were poisoned after having drunk a glass of rum strongly impregnated with cocculus indicus; one of them died. This case is alluded to in

Dr. Taylor's book on Toxicology; but as I understand he will be examined before the Committee, he will be the proper person to give the Committee information upon that subject. All those adulterations are very injurious; some of them are really diabolical. Oil of vitriol and sulphuric acid have somewhat terrifying names, but in the proportion in which they are used they cannot be looked upon as poisonous. Still, they would have an injurious effect, for I believe you cannot add to food any chemical compound whatever with impunity. These adulterations are so extensive, that if any one were to meet with pure gin in London, he would be very much surprised. I do not think it is to be had from publicans at any rate. I really do not know what pure gin ought to be made of, because I am not very well aquainted with the manufacture of it; I believe it should be nothing but spirit, distilled from different forms of sugar, either malt or some fermented grain or other. I believe the juniper berry never exists in English gin; in Hollands it does, but gin, I believe, is only distilled from grain. Publicans use the expression "fancy gins;" gins made to suit the fancy of their customers. The difference between the gin of Mr. B. and Mr. C. altogether depends upon the compounds which are added to it; the taste of the gin bought at various places differs very much. I think gin is the favourite spirit of the people of London; they consume large quantities of it, generally in a raw state, by people standing at the bar, who come in and drink a glass of gin, and go.

Other spirits are equally adulterated; it always amounts to this, with respect to spirits: the object is to sell water for spirits, but if you put in water you destroy a certain amount of alcohol, and then the ingenuity of the publican comes into action to restore the intoxicating property, and that is done by the addition of some deleterious article. I have not detected any particular substances in *brandy*. I believe it is manufactured extensively in this country, especially since the discoveries of modern chemistry, of producing essential oils artificially, which have the odour of that particular ether to which brandy owes its flavour; and in the same way, pine apple rum is nothing more than spirit manufactured in this country, to which the flavour of the pine-apple has been given by the introduction of a few drops of those new essences, the discovery of which is one of the most beautiful results of modern chemistry. They are not produced from the fruit, but from rotten cheese, or from bi-chromate of potash. It produces a sweet flavour. If you introduce the fucil oil, which is produced in the cuticle of the grain, it can be removed by the rectifier, and you obtain in this way a peculiar and somewhat offensive oil. I have seen the Messrs. Bowerbanks' large distillery, and a very clever distiller he is; he took great pains to separate this fucil oil from his spirit, but it was a perfect waste. It was used for burning in his establishment; but now the chemist can produce from it essence of jargonel, an essence which has precisely the odour of the finest jargonel pear. Valerianic acid is occasionally produced, if it is not carefully manufactured; that partakes of the jargonel odour, but it is somewhat offensive. Owing to chemists having been able to manufacture a great many fruity essences, if I may so call them, they have been able to supply the perfumer with essences which otherwise must have been very costly, and the distiller with the means of imparting to certain spirits the flavour of the genuine liquids. Brandy may be made, as every body knows, by submitting a low and strong Bordeaux wine to distillation. The odour of the brandy is due to a portion of essential spirit, or ether, which distils over with the alcohol. Hitherto the flavour of brandy could not be imitated; even what was called British brandy was an abominable stuff; but now brandy is manufactured in London. I cannot say that it is so good as real French brandy, but it certainly is a great step in advance of what was originally British brandy. Artificial British brandy now is drinkable, and may be palmed, as it were, on the unwary for French brandy.

I have examined the *milk* in London; the pump is the adulterator of milk, but there is something very disgusting in the way in which the milk is obtained. In Clerkenwell I had occasion to go to see a well, to examine the water which was obtained from it, and I saw there a spectacle which prevented me from tasting milk for six months. I saw about thirty or forty cows in the most disgusting condition one can possibly conceive, full of ulcers; their teats in a most horribly ulcerated condition, and their legs also full of tumours and abscesses; in fact, it was terrible to look at; and the fellow was milking these poor cows in the middle of all this abomination. I have understood since that that is by no means an exception, but that the animals of a great many cow-keepers are in the same condition; so that what is introduced into the milk besides the water, which is comparatively nothing, is actually the product of disease. I have no doubt you have a mixture of diseased matter introduced into the milk; I assure you that for six months I could not touch milk. This was about two years ago; since then milk has come much by railway. The manner of keeping the animals induces disease; and the litter on which they were standing was a mass of fermenting matter; it was more as if they were standing on a dung-hill than litter. I have reason to believe that there are many such dairies or cow-feeding establishments, but the one I mention I actually saw. I have frequently analysed milk in London; it is always watered. I never found chalk; it would be a stupid means of adulteration, because it would subside. Milk will bear an enormous quantity of water without being much deteriorated in appearance; you may introduce three-fourths of water into milk, and yet it will still appear to be milk; there will not be much difference; it has only a bluer tinge. The actual proportions of the water may be detected by proper investigation: by means of a good galactometer you could do so; none of them give very accurate information, but they give an approximate result. You take a galactometer, which is a glass tube divided into 100 parts, and you pour pure milk into that glass, and fill it, and let it stand at a temperature of from 60° to 68° Fahrenheit; 46° to 47° are said to be the temperature which gives the greatest result; but for practical purposes, from 60° to 68° is the one on which I have generally operated. I find that after twelve hours pure milk gives eight of those divisions or degrees of cream; if the milk is diluted with one-third water, you find that you obtain only six divisions of cream instead of eight. If diluted with half water, you obtain five divisions; and if diluted with two-thirds water, you obtain three divisions only of cream. I should say that this is only an approximate sort of test, because the quality and description of food which is given to the cows influences a good deal the proportion of cream which would be obtained. There is another way in which you can arrive at something like a correct result; if you take 1,000 grains of milk and evaporate it till it ceases to lose weight, you obtain a residue which averages 70 grains. If another portion be treated with vinegar or acetous acid and coagulated, and the curds which are produced are separated and squeezed in order to give back every part of the liquid they contain, and then evaporated, you will find from 4 to 5 per cent. of dry residue left.

With reference to milk obtained from diseased cows, I have no doubt that milk so consumed must be very injurious to health; and if given to children, particularly so. I will take advantage of this opportunity to mention something which occurs to me at the moment in reference to another article, namely, bread. I have known bread made from water in a most putrid state. There was, a few years ago, on the canal, a bread factory, and the water for making the dough was actually taken within a foot of a cesspool. There was an overhanging privy, and within a foot of that there was a pipe connected with the pump. I say this to illustrate my opinion, that all these "mickles make a muckle" in the end. There is a great quantity of purulent matter absorbed or taken into our food from the water which we use, the milk we consume, and other substances of the kind, all of which, if only taken once or twice, would not do much injury, but which, being constantly repeated, must do very great mischief. The *excreta* certainly were never meant to be taken in again, and I am satisfied that a great deal of the diseases, and the epidemics which visit this metropolis, are referable to causes of that kind.

With respect to *bon-bons* and *confectionery*, my evidence is corroborative of Dr. Hassall's. I have found arsenite of copper, chromate of lead, orpiment, sulphuret of arsenic, red lead, and vermilion. I can also confirm what Dr. Hassall has said about *cayenne pepper;* I have found red lead, but, generally speaking, the adulteration is ground rice and brick dust, which appears to be a very valuable article for the purpose of adulteration, and common salt, also, to a very considerable extent. Some of the samples have been scarcely anything but common salt coloured with a little pepper. *Cheese* is sometimes adulterated, but there is only one case on record of red lead having been found in cheese; that was traced to the annatto, which is a colouring matter employed for imparting a creamy yellow colour, and which had been adulterated with lead, and that annatto having been used for colouring the curds, the cheese was of course poisoned; a gentleman who partook of it nearly lost his life in consequence. With respect to *pepper*, that is an article which is adulterated to a considerable extent; it is adulterated with husks of white and red mustard; in fact, the "Times," on the 10th of May, 1852, states that one Theobald, a grocer, at Chelmsford, was fined £50, evidence being brought forward to show that a cask had been seized, the whole bulk of which was 100 lbs., and which contained only two pounds of pepper, the rest being husks of mustard, chilis, and rice. None of these are noxious in their qualities; it is only a fraud, making a difference between the terms "fraud" and "sophistication.' Rapeseed cake is employed extensively in the adulteration of pepper, and also linseed cake; so also ground clay and potatoe starch.

With respect to *water*, it is quite refreshing to think that something is about to be done to give us a pure supply. Water is the only substance which I know of which, to be fit for consumption, must not be pure, that is to say, it must contain some air. Pure water is of course, a chemical affair, and contains no air whatever; it consists of water, and nothing but water; but such water is unfit for consumption, because it contains no air; it is indigestible, heavy, and in fact it would appear that distilled water, which is pure water, and which is supplied to the Navy occasionally from stills, is actually so vapid after a few days' use that the sailors will hardly drink it. Some years ago that subject engaged my attention for the purpose of producing water for the use of the Navy which should be aërated. I am now erecting at Heligoland, by order of the Government, twelve apparatuses of that kind. I only allude to that for the purpose of shewing that water, in order to be salubrious, must contain a certain quantity of air. There is a recommendation which has been occasionally made, by Dr. Lyon Playfair among others, of boiling water procured from impure sources; I mean such sources as the water companies resort to. Dr. Lyon Playfair and other eminent men have rightly enough recommended that all water should be distilled; unfortunately, distilled water contains no air; consequently, water so produced very soon becomes unpalatable. But there is something worse than that; by reason of its containing no air, it has a great tendency to take air from the medium where the water is kept; so that if distilled water, which contains no air, is kept in a ship's hold, or in an impure dwelling, it will absorb precisely the quantity of air which it can absorb, namely, five cubic inches per gallon, and becomes perfectly putrid and fœtid; this is so important a matter, that water should always be kept, when it has been distilled, in perfectly pure rooms or receptacles, or else it will become as foul as before. Dr. Stenhouse, three or four years ago, found that charcoal had the power of purifying air; now I have found, acting upon his data, that charcoal has the power of purifying aërated water, which contains foul organic matter, provided only the water is aërated, that is to say, contains air; hence it is, that if the water companies were to pass the water through large filters containing charcoal, the water so obtained would be rendered perfectly sweet. My own experience has taught me, in reference to my apparatus for the distillation of sea-water, to which I was alluding just now, that two cubic feet of charcoal are sufficient to purify perfectly 500 gallons of aërated water; and the value of this suggestion is, that the charcoal does not require renewing; when once the filter is made, it will last for ever, because it disinfects the water as it does the air, not by mechanical separation, but by actual destruction; organic matter undergoes in the pores of the charcoal, in the case of air, the process of slow combustion, so that the organic matter which rendered the air foul becomes converted into carbonic acid. This is what Dr. Stenhouse found, and it is a most important discovery; starting from his suggestion, I found the same effect was produced upon water when it contained air; that is to say, water which contains five cubic inches of air per gallon may be thoroughly disinfected by the slow burning of the organic matter which it holds in solution. That water has the power of absorbing and dissolving organic matter in this way, may be illustrated in a very simple manner. If you distil water, from whatever source, the distillate will be fresh water, a pure water; but it will have a peculiar empyreumatic odour; a smell which renders it undrinkable for a while. If, when it has become sweet again by standing, that water which is then pure is re-distilled, you will have the same empyreumatic smell. Why is this? In standing, as it contains no air, it will have re-dissolved the air of the chamber in which it was kept, and it will have re-dissolved along with that air whatever organic matter was present in infinitesimal quantities; and it will become putrid when submitted to distillation. The only condition which is necessary, therefore, that the water should not become putrid again is, that it should be aërated, because when once it contains as much air as it can possibly take up, it can take no more; it is like a sponge when filled with water; and it is owing to this, that when on board ships a supply of fresh water is taken in for the use of the crew, after about a fortnight that water becomes putrid and almost undrinkable; that is, because the organic matter which that water contained is undergoing the process of putrefactive fermentation. The water remains about a month in that putrid state, and it gradually becomes sweeter and sweeter, till it becomes drinkable again, because all the organic matter it contains has resolved itself into other elements, and the water contains no organic matter; but as the water is filled with air, it cannot absorb fresh air, and therefore it becomes perfectly sweet. When, therefore, we conceive that the water which is supplied to this metropolis is hardly anything else but diluted mud and sewer refuse; that it contains the *excreta* of two-and-a-half millions of inhabitants, their daily ablutions, the washings of their foul linen, and the filth and refuse of hundreds of factories; the offal of markets, the foul matter of slaughter-houses, and the purulent abominations of hospitals and what not, I think it is astonishing that we are not much worse off, in point of public health, than we really are.

With respect to the adulteration of medicinal substances, I found that *acetate of copper* was adulterated with chalk; *annatto*, with ochre and red lead; *assafœtida*, with chalk, clay, and sand; *bicarbonate of potash or soda*, with neutral carbonate, chloride, and sulphates of the same bases; *cream of tartar*, with chalk, alum, and sulphate of potash; *calomel*, with chalk, sometimes to the extent of 60 per cent., sulphate of barytes, and white lead—the *white lead* itself being adulterated with sulphate of barytes, sulphate of lead, and chalk; *carbonate of soda*, with sulphate of soda; *chromate of lead*, with sulphate of barytes, carbonate of lead, and carbonate of lime; *copal*, with gum-anima, gum-dumma, and common resin; *cochineal*, with sulphate of barytes, and Venetian talc; *iodine*, with water, black lead, sometimes to the extent of 25 per cent., and crude sulphuret of antimony; *linseed-meal*, with bran, clay, and saw-dust; *litharge*, with earthy matter; *magnesia*, with lime, a species of clay called kaolina, carbonate of lime, and sulphate of barytes; *mercury*, with lead, tin, and bismuth; *nitrate* *of potash*, with common salt; and *nitrate of silver*, with nitrate of potash. *Opium* contains starch, mucilage of gum, clay, and sand. *Quinine* is adulterated with gum, starch, chalk, sulphate of barytes, and stearine. Those adulterations render it very difficult for physicians to calculate the effects of their prescriptions upon their patients. If quinine is given in the hope of preventing ague, and you give gum and starch, or stearine, you cannot produce the effect you desire. What I have related now I have actually found; there are a great many other adulterations, which I know are practised, but I have not examined them personally.

In Paris there is what is called the Conseil de Salubrité, by which some good is done, but much less than ought to be. Those Conseils de Salubrité Publique consist of the préfet, who is the president; a vice-president, who is a man of great standing, too; twelve members from among the first chemists in Paris, five adjuncts, and twelve honorary members, all first-rate men; so that you have every guarantee which quality and quantity can furnish; but then they meet only once a fortnight, and you can hardly expect that a poor man who buys half-an-ounce of coffee, and finds it is adulterated, can go to them for redress; he does not know where to get it; it is only when the inspector goes about and secures a sample, which appears to him what it ought not to be, that he refers to this Council of Health, and then the man is punished. But though that does not do all the good it ought to do, still the very fact that there is such a Conseil de Salubrité, and that a dealer is liable to be visited with punishment, and, which is worse than that, with the loss of character in his business and his neighbourhood, acts very beneficially. I am inclined to think, that if each parish or district had, according to its importance, a certain number of men of acknowledged probity and capacity, who would have no interest in acting in a vexatious manner, but to whom cases of adulteration could be referred, or respecting which advice could be taken, a great deal of good might be done. You could not altogether do away with adulterations and sophistications, any more than you can do away with theft and other dishonest practices, but it would singularly diminish the number. At present competition, instead of being what it ought, a competition of skill as to who shall produce the best article at the cheapest price, is now really a competition as to who shall adulterate with the greatest cleverness. What a tradesman tries to do now is, not to gain a victory over his neighbours by supplying either a better article or the same article at a cheaper price, but his endeavour is, "How shall I take my neighbour's custom from him by offering an article which will look as well, but which will cost me less?" and consequently he sets about debasing the articles, and very often succeeds in robbing the honest trader of his fair share of custom. "And sometimes poisons his customers into the bargain?" says the chairman. "Yes," adds the witness; "and then the honest man in self-defence begins to adulterate too; so that it is a wide-spread evil which has invaded every branch of commerce; everything which can be mixed or adulterated, or debased in any way, is debased."

WEDNESDAY, JULY 25TH, 1855.

EVIDENCE OF JOHN SIMON, ESQ.

I AM connected with the City of London as its Officer of Health, and have, in that capacity, had abundant opportunities of noticing what it is which affects the health of the inhabitants of London. The City of London exercises no special jurisdiction in the matter of adulterations, and therefore I have had no special opportunity of examining it; and perhaps I should save your time by saying I am not competent to give you the details of adulterations. I have made no special investigations of them, but I have looked at the subject merely as a subject for legislation. I can speak to the fact that adulteration does exist to a certain extent of my own knowledge; but I know it far better by the testimony of chemists and microscopists who have devoted themselves to that inquiry. I have no doubt that the existence of that adulteration is very injurious to the public health. I have turned my attention to the remedies which it would be desirable to employ, for the purpose of putting an end to this frightful system, and it appears to me that the person who suffers by the fraud ought to have his remedy by some summary proceeding before a magistrate; but beyond that I think there should be a remedy obtainable by means of certain local authorities, because, generally speaking, the individual suffers from time to time in such small proportions, and so unconsciously, that he is scarcely a fit judge of the amount of injury he sustains; for instance, in the case of water, for that is a subject within the cognizance of the Committee, the people who drink the filthy water which is distributed over part of the south side of London are not competent judges of the amount of injury it may do them; and for any individual there to attempt to proceed against the vendors of that water would of course be out of the question. So with the adulteration of drugs, not only among the poorer classes of society, but among the more educated classes of society; it would be ridiculous for any individual to pretend to judge whether the dose of laudanum he buys is of standard strength, or whether the scammony he buys is adulterated with chalk. It would be out of the power of any individual to make these analyses; and because of that ignorance on the part of the individuals who suffer, I think local boards or competent officers ought to have power to interfere in such cases. Local boards of health, under the Public Health Act, would exist only in few parts of the country; but I think the local board, whatever it may be, which is charged with the administration of the Nuisances Removal Act, might be a competent Board for dealing with this matter. In places which are under the operation of the Public Health Act, there would be a local Board of Health; in other places it would be some other body. I think the Board should have the power of proceeding in certain cases against the vendors of adulterated goods; and whether a penalty is to be recovered or not, they should have the power of publishing the names and addresses of the offenders. I am inclined to think publicity would be a very important element in the cure, whether further remedies are also introduced or not. The persons to be appointed inspectors of nuisances under the Nuisances Removal Act, now before Parliament, would not be persons competent to make the necessary investigations for detecting adulterations; but this is a department of medicine which is gradually growing up in this country, and I suppose before many years have elapsed there will be in most parts of the country the power of referring to some competent person to give evidence in cases of this description. In large towns there would be the officer appointed under the Public Health Act; in other places probably there would be some officer of the kind who would be competent to give evidence. Still I should think it a great advantage that there should be, in every small district, such as those contemplated by the Nuisances Removal Bill, some authority charged specially with the power of taking proceedings against adulterators; for although, in some of the smaller localities, the power would perhaps for years remain dormant, yet it would be worked in the large districts very usefully; in London, for example, and other large towns. If a person who might be called a chemical inspector were connected with any of the public authorities who might be authorised to prosecute, I think that he, by an analysis of the article, might give a great deal of useful information. By the 6th and 7th Will. 4, if a person having adulterated his flour is found guilty, his name, the place he inhabits, and his offence, are to be published in the papers, and he is liable to be fined £20 for each offence, and £10 if any of the ingredients be found upon his premises. I would, as far as possible, introduce the principle of that Act in all cases of adulteration, subject, as far as I can see, to another principle. It strikes me that the object would be to punish adulteration only as it is hurtful to health. As a mere commercial fraud, I apprehend it would be contrary to the general intention of your legislation to deal with it. The vendor of the adulterated flour, I presume, would be punished not for the commercial fraud, but for a fraud which was hurtful to health. The buyer of damaged corn, or adulterated corn, would not be protected by any special apparatus of this kind against fraud, any more than the purchaser of a horse or an umbrella. I apprehend it would be intended that the purchaser should protect himself, or the law will leave him unprotected, against commercial fraud. But where the fraud becomes hurtful to health, and the individual's means of detecting the fraud are insufficient, the Legislature will interfere. I would exclude from the liability to penalties the person who fraudulently mixes an inferior with a superior article, but I would punish what is termed, in one of our works, the surreptitious introduction of articles which, taken in large quantities, are prejudicial to health, and any admixture of deadly poisons used to improve the appearance of the articles adulterated. In Paris there is a Conseil de Salubrité Publique, which takes cognizance of these matters. It would be the business of whatever Conseil de Salubrité might be advising the Government in this country, to say which are the cases in which adulterations are hurtful to health. The end might be probably attained in such a way as this: the Privy Council either of itself, or moved by the Board of Health, which one supposes would be advised by proper pathological authorities, should from time to time publish a schedule of adulterations hurtful to health, and in all those cases the power of procedure should rest either with the individuals aggrieved, or with the local boards. In every case I would have a public prosecutor, in the form of some local authority. I think if the Board of Health is to be constituted according to its title, it would be the proper authority to deal with subjects of this kind. There seems at present to be a considerable distribution of sanitary responsibilities; little dabs of doctoring are done by several departments of the Government, but it would probably be desirable that so important a matter as this should rest with the Board of Health. As far as I know the constitution of the Board of Inland Revenue, there is no element in that Board which is capable of advising on matters relating to health. I believe they have chemical advisers; but it would require more than chemical advisers to do justice to this subject. Chemical advisers would make them thoroughly informed as to the presence of certain adulterative ingredients in the matters sold, but would not of necessity be competent advisers as to the effect of such admixtures on the public health. I have stated that there are extensive adulterations of articles sold to the public; there is one example which is not verified by myself, but it is so extreme a case that I may mention it. In the Pharmacopœia of the College of Physicians there is a drug, which I believe is not a very important one, called *calamine.* It being in the Pharmacopœia, we may prescribe it at any moment. I am informed by my colleague, Dr. Thompson, who is a professor of chemistry at St. Thomas's Hospital, that for years there has not been a specimen of calamine in the market; what is called such is made of all sorts of things imitating the colour, and to a certain extent the texture of calamine; but of the article so mentioned in the Pharmacopœia, there has not been for a length of time a specimen in the market. A day or two ago I was in a pickling establishment, not on the business of looking after adulterations, but on other matters. I saw a person employed chopping up fish, and seeing by his side a keg of red stuff, I asked permission to gratify my curiosity by looking into it; he was placing his fish on a red slab, and obviously this was a pigment intended for admixture with the fish. I asked what it was, and was told it was Venetian red; that the public did not like their anchovies unless there was a particular colouring with them, and this was kept for the very purpose of that admixture. That perhaps again, is not a very important admixture. Then also there is the notorious adulteration of bread by alum, which I believe to exist almost universally.

I propose, in any case of adulteration of food or drugs which is prejudicial to health, to give a summary power of procedure before a magistrate. The officer of the local board specially appointed for that purpose would test the adulterations, and decide whether they exist. There would be the same sort of evidence given as is now given in criminal cases to prove the presence of poison in a body. I assume that the local boards exercising the powers vested in them would appoint a properly qualified person to make analyses. Whenever the local board thinks it necessary to exercise those powers, either a special officer should be appointed, or that particular duty should be added to the previous duties devolved on the officers already existing; in districts where there is an officer of health appointed, he should be the examiner. The Nuisances Removal Bill provides that an inspector of nuisances shall be appointed by the local authority, whatever that authority may be, and one of his duties is to inspect and inform against bad meat, vegetables, and other articles of that kind; officers of that kind exist in the city of London, and there is a very large condemnation of damaged food. Those inspectors of nuisances are, by the Bill now passing through Parliament, to be appointed in every district of the country.

I have drawn a distinction between adulterations which are prejudicial to health and those which merely depreciate the quality of the goods. The case of *bread*, which is mixed with potatoes, I would say was an adulteration prejudicial to health. To a man who can only afford to spend 3d. a day upon his bread, whether he gets his three-pennyworth of bread made of wheaten flour, or gets it made of wheaten flour mixed with potato flour, is an important sanitary consideration. But I suggest that the formation of a schedule of cases to be dealt with should rest with some fully competent medical tribunal advising the Executive, and would leave cases of that kind to be determined on by those who had to adjudicate. Wherever the local board is the prosecutor, I presume the officer of the local board would be a witness in the case; but wherever individuals might proceed, I presume it would rest with those individuals to supply their own evidence. In stating that I thought the powers of the Act would be dormant in small districts, I meant nothing further than that in such districts, the application of knowledge generally is a slower process than in the wealthy and more populous. There can be but little doubt that in the large towns, such as London, Manchester, and Liverpool, special officers would be appointed by the local boards to examine the matters which come within the law, but that could hardly be the case in the poorer districts.

With respect to the adulteration of drugs, I think that is a matter of very great importance, as leading to the uncertainty of pharmaceutical preparations. Assuming the facts to be well established, it is stated, on good chemical testimony, that some of our most frequently used medical preparations vary largely in their strength. One hears of *prussic acid*, which is given two or three drops to a dose, which varies 50 per cent. in its strength; one hears of *laudanum* and *opium* varying fourfold, or sixfold, or eightfold in strength. Now, it will be obvious, of course, that very great evils may arise from our having professionally no certain standard of a dose. It is impossible to have a standard dose otherwise than a very general one; you cannot, with security, prescribe a definite dose with an indefinite effect to be produced when that is the condition of the drug market. The College of Physicians and the Apothecaries' Company exercise, I believe, concurrently, some jurisdiction in this matter; but I am informed that that jurisdiction is only within the boundaries of the City of London, so that it does not affect the metropolis generally. I have not great personal knowledge with respect to the adulteration of drugs, for in the hospital in which I am surgeon the practice is adopted of examining carefully all drugs which are supplied. I speak, however, from frequent conference with the gentleman who makes those examinations, and who will presently give evidence to the Committee, Dr. Thompson. In my private practice I have sometimes been surprised with the disproportionate effects of doses, but that would occur, no doubt, much more in the poorest neighbourhoods in London; among the lower class of drug-shops there is more liability to that state of things occurring. I cannot say that I have found a marked difference in drugs purchased from different chemists' shops. I have observed a difference in the effect of doses, but one cannot say with certainty that that does not arise from a peculiarity of habit of the patient.

Analytical chemists would be the best officers to establish the fact of adulteration, but I do not think they would be the best to advise upon the sort of schedule I have suggested, which would be a list of articles falling within the operation of the law. I think, as regards the publication of a list of that kind, that whatever tribunal might be considered suitable for advising the Executive generally on matters relating to health, would be best composed of medical practitioners. There are two separate questions. In the case of anchovy sauce, for example, you produce the fact of there being mixed with it a great quantity of ferruginous clay, bole Armenian, or Venetian red, or something of that kind; on that fact the testimony of chemists would be the best evidence. But when it comes to the question, how does this affect health? ought it to be a matter of prosecution? ought I to be entitled to proceed against an Italian warehouseman, because he sells me anchovy sauce with this red stuff in it? I think that part of the inquiry should not be a chemical, but a medical question. When that has been done, persons of an inferior grade to that of medical practitioners might, in some cases, detect whether those substances were actually present, but generally speaking not. I think you would find that persons less qualified than educated medical or chemical inquirers would not be competent to do so. It would be unwise, I think, to entrust chemical tests to persons who do not know the rationale of their application. The inspector of nuisances could scarcely be expected to have chemical knowledge, and to put a test into his hands to be used without chemical knowledge would be an uncertain mode of proceeding, I think. The inspectors of nuisances in the City of London, where I know most about them, are men of about the level of masons' foremen. In some cases undoubtedly a very uneducated person could speak to the fact of adulteration, but not I think in all cases, nor in the majority of cases; but in every part of the country you have a poor-law medical officer who would be competent to do so. As public attention is now only beginning to turn itself to the subject in many districts, they might not be highly qualified, but they certainly would be very much more qualified than any of the laity would be. Generally speaking, they would be likely to possess the necessary qualifications, or they would be able easily to acquire them. They are educated in the use of the microscope, and in the application of chemical tests; and those are the great means of detecting adulterations. Take the case of arsenic-poisoning in the country; it very frequently happens that conclusive medical testimony is given by one of those officers, evidence of the presence of arsenic, which convicts a man of murder; but it would be hopeless to get a set of analytical chemists in every small town or village of the country. I think the poor-law medical officers generally, throughout the country, would be the best persons to act with the local boards in matters relating to the public health. Of the existing elements in villages and in small towns they would undoubtedly be the most likely persons. It is required for their appointment that they shall have passed certain examinations, and have gone through a certain course of education; instruction in analytical chemistry forms part of that education. There would be differences among them; but looking forward to a period of ten years after the laws against the adulteration of food had come into action, in my opinion they would form a very highly qualified class. I of course assume that they would be properly remunerated by the local board; and as I presume a poor-law medical officer is willing to extend his means of earning a livelihood, I do not think he would object to this as one of such means. The greatest difficulty would be the fact that the medical officer of a parish is the medical attendant of the greater part of the tradesmen of the town or village; but the other duties likely to devolve upon him in the progress of sanitary regulation create a difficulty of the same kind. The necessity that he should give evidence in many cases of nuisance is a difficulty of just the same nature; and I do not see how that difficulty is to be escaped from, except by what I suppose will eventually be the arrangement of the country, under which the poor-law medical service will be on the same footing as the army and navy services, and there will be a set of public officers distributed through the country having no private practice, but attending entirely to matters of public health.

EVIDENCE OF SIR JOHN GORDON.

I AM the Mayor of Cork; and my attention in that capacity has been a good deal devoted to the consideration of adulteration, flour particularly, and butter and wheat. Shortly after I came into office many complaints were made to me from different parts of the city of *flour* bought in a particular house. Latterly, in consequence of the very high price of the loaf, the poor people have been in the habit of making their own bread; they buy what they call weights of flour, a weight of flour being 7lbs., and they pay from 10½d. to 1s. for it; 3½lbs. of that will make the weight of a quartern loaf, so that instead of paying 10d. for the quartern loaf, they have it for about 6d. A considerable amount of fraud certainly results, in consequence of the high price of bread forcing the poor people to have recourse to that means. My attention was directed to the flour sold to the poor people, and in one case particularly, very many were, I may say, almost poisoned from the nature of the flour which they bought; we instituted inquiries, and had the party, in whose house the flour was sold, summoned. There could have been no previous arrangement, because the persons who complained came from different parts of the city; I examined them all separately, and found that the material was so bad that it was producing very violent gastric affections, purging to a considerable extent, sickness of stomach, and so on. After issuing a warrant for the man he disappeared, and he has not come into the city since; but some of the people who sold flour, and particularly his foreman, who sold it under his directions, gave an account of the kind and description of flour it was; it was flour which had been warehoused in England for such a length of time that it had suffered decomposition; it became so bad that it could not be sold here. The flour was sent over to Ireland, and it was there found to be unsaleable also, so bad was it. However, by mixing it with a certain quantity of pollard and a small quantity of sound flour it was sold in this state. I got a portion of it analysed by the most adroit chemist we have in Cork, who is connected with Queen's College, and he ascertained that the flour was unfit for human use; the gluten was absolutely decomposed; the fecula was greatly deteriorated, and altogether it was in such a state, that unless it had been mixed with pollard to dilute its effects, it could not have been used at all as a material for human food. I apprehended at first there was some metallic matter in it, but on close analysis we could discover nothing of the kind; I suppose there was an earthy matter. There is in the neighbourhood of Cork an earth called barytes, and I apprehended that, from the deleterious effects on the parties, something of that kind might have entered into the composition of the flour; but I afterwards ascertained that this barytes was used as a material in paint; and there was no earthy or metallic matter, so far as I could detect, by analysis. I have been six months in office, and there is scarcely a week that some case does not come before me. There is a great deal of competition among the small class of millers. In the production of this cheap material for the poor, the person who sells the cheapest obtains the largest amount of business. I have had others of those inferior and unhealthy samples analysed, and I have summoned the parties to the court, and in many instances had the flour seized; we find it rather a sharp thing to break up a man's establishment. He may be very honest himself, but he buys the flour from the millers and retails it for his livelihood; and in some cases I did not like to break down a party, considering that exposure in a few cases would have a good effect. We have a market jury struck every three months, whose duty is to visit every place where food is sold, if they have reason to think there is anything improper in it. I have gone occasionally to a corn store, where I have found grain in the most awful state of decomposition; in fact it was so bad that I said there must be something in this more than mere vegetable matter; such turned out to be the fact; it suffered at sea, and a particular insect became so numerous in it, that when they died, it absolutely produced the smell of animal as well as vegetable decomposition. I, myself, was the party who directed the analysis in the case I have spoken of; in consequence of the impression which was made, this man being obliged to leave the city, it had the best effect for a very considerable time; though cases have come before me every week, yet so far as I could see myself, the flour was not always so bad as the people wished us to believe; every man who sold cheap flour was supposed to sell very bad flour. There was one very extraordinary thing happened within the last six or eight weeks; there was sent up to me, from a neighbouring town, a quantity of material which was imported from England in very large quantities by a miller; it was supposed to have been sawdust finely dressed up for the purpose of mixing with flour. I paid every attention to it, and by the microscope I detected, and my opinion was confirmed by others very conversant with the instrument, that it was the hulls of wheat, barley, and oats, which was so admirably well dressed up as to have all the appearance of pure flour. The miller was in the habit of importing this, as it was represented to me; he was out of my jurisdiction, and I could not take any cognizance of it. The first case I gave the Committee was the strongest; the unfortunate people were not only robbed, but their lives were endangered; for a poor man who lived on 2 lbs. of bread a-day did not take in one-fourth of that amount of nutrition. When there has been a complaint made to me, I have not ordered an analysis to be made in all cases. When this bread has been brought to me, I have ascertained from its taste and smell that the complaints were rather exaggerated, and I did not think an analysis necessary; in fact, I found it very difficult to get an analysis made to my satisfaction. In those cases where I did not proceed against the parties, there was reason to suspect that the flour was adulterated, more or less. The parties raised the price of the article they sold after I had prevented that stuff from being sold as flour. The party I prosecuted was selling it at 10½d. the 7 lbs. The general price immediately afterwards was 1s. Indeed the mere circumstance of his selling so low proved to me that there must have been something foreign mixed with it. To show what poor people might do, I myself bought a quantity of wheat, and I ascertained that a small hand-mill, turned by a man, would turn out as much as 30 stone a day; and I had in my own family some bread made with the flour produced from this mill, which was palatable and cheap, fully as cheap as the miserable stuff which was sold by those parties. We wanted to establish some system of that kind in Cork, but there was not sufficient energy or perseverance among the parties to follow it up. If these people had not been taken ill I should have hardly heard of the circumstances. The market jury is sworn in the collector's court; they are twelve in number. Lately I have so arranged them that every two jurymen take a ward, and I have allocated to me the particular inspection of the central ward. Those men are not scientific men; their duty is, when they have reason to think there is anything injurious exposed for sale, to call my attention to it, and have part of it sent to my office, and then the matter is investigated. It is hardly my duty to submit those things to a chemist for examination, unless I am in doubt myself, and think it necessary. There is some expense attending calling in assistance of that kind, without there being any fund provided for that purpose. I had reason to think there must have been some earthy matter, but I could not detect any. I have heard of an admixture of millet-seed with bread. There is every description of farinaceous matter mixed with flour. There is an Egyptian grain called dari, and that was imported in very large quantities at one time into Cork; that to a moral certainty was for the purpose of mixing with wheaten flour; they were able to sell that for £6 a ton, while the other was bringing nearly three times that amount. Pea-meal and bean-meal has been known to be mixed with flour also; those are less nutritious than wheaten flour. The adulterations sometimes originate with the wholesale millers, and sometimes with the retail tradesmen. I have had no cases of conviction before me of a wholesale miller. The course pursued is to seize the article, and in the regular course of proceeding we impose a fine. I have not done so, because, in the case where I would have done it, the man escaped my hands. Some time ago a very large quantity of wheat from the Mediterranean was imported by a very extensive merchant; it was so bad that my attention was called to it; but I ascertained I could not seize it, because the man got over the difficulty by saying it was so bad that he would not sell it to be used for human food, but he intended to sell it as food for pigs.

I saw lately a very large quantity of *butter* which was brought to me; it was seized and destroyed. It appeared to me to have been merely curds mixed with a certain quantity of butter; it was made in the neighbourhood of Cork, and brought in in firkins. It was sold at the price of good butter; the party who bought it detected the fraud which was committed on him, and he reported it to me. I made the party pay back the money he received, and had the butter destroyed. I was only able by the microscope to ascertain the fraud; it is very hard, by chemical analysis, to satisfy yourself on the subject. I think the microscope is the preferable mode. Butter is a principal article of trade in Cork. The small farmers in the neighbourhood, who cannot fill a cask, send in 18 lbs.

or 20 lbs. at a time, and this is bought by parties who afterwards cask it when they have a sufficient quantity. This butter was manufactured in this kind of way; 18 lbs. or 20 lbs. of it was sent in at a time, for the purpose of its being casked and brought into the regular warehouse, and in transferring it from the small cask into a larger one the party discovered it was so bad that he reported the matter to me. Butter is occasionally mixed with foreign matter. I have heard of a strong paste being used. I am now speaking only from hearsay, and what I believe from an inspection of the material. The butter which is exported from Cork to England undergoes a very accurate inspection by regular inspectors at Cork, and bears a better price than butter from other places, in consequence. Buyers are willing to pay something more for the sake of security as to the genuineness of the article; the butter is sold as firsts, seconds, and thirds. I believe the market is supposed to be the very best in the United Kingdom, they are so particular in the examination of the article.

I have seen a quantity of *coffee* which appeared to me, on making it, to have a very large proportion of crusts of bread which had been ground up, and exhibited all the appearance of real coffee. I saw that myself. My attention was particularly attracted to it in consequence of its being sold so much cheaper than coffee in respectable houses. There might have been chicory in it; but I did not detect it. I believe roasted corn sometimes enters into the adulteration of coffee, but on this occasion I found only crusts of bread.

There are other articles which I have made the subject of inquiry; *milk*, for instance. I almost daily seize on pails of milk, in the winter particularly; it is very difficult to act with the lactometer in the summer; it is not a very accurate instrument; if the milk is very rich it will produce very nearly the same effects on the lactometer that it will if it be very poor; if you dilute milk with a certain quantity of water, it will give you nearly the same specific gravity as if it is rich in cream. The instrument is of no use at some particular seasons; in summer I can never trust to it. I have constant complaints about the condition of the milk, that it is bad; that in fact it is sour, though sold as new milk, and that it is diluted with water to a very considerable extent. Upon these occasions I have seized it. The lactometer is used, and the market jurors are so very adroit that I very seldom find them to be mistaken; so sure as they say that it is adulterated with water, I find it to be so on using the lactometer. Nothing else is put into milk. I think it is a mistake to suppose there is any chalk in milk; you may make cream by means of arrowroot and so on. An ounce of arrowroot of the value of 1½d. will make about three pints of a fluid as thick as cream.

These frauds are practised to an extent to be quite a grievance to the people. Since I became Mayor of Cork I have satisfied myself that adulteration is practised to a fearful extent, and that unless some stop be put to it, it is impossible to say what the consequences may be. Cork is a great port for the exportation of flour. I have every reason to believe that the great millers adulterate their flour, but I think it is not done for this market; it must be for the home market. They get the proper price in England; but the great competition among the poor causes them to send into the home market a very improper material. I have not heard of the flour which is exported being complained of; I know that with the view of producing a very fine wheat flour they have tried a number of bleaching ingredients, and among others a kind of acid. I have known respectable men in the milling trade experimentalise with acids; they have sprinkled acids on the corn before it is kiln-dried, with a view of producing as white a material as possible. That is practised upon inferior flour to make it whiter, so as to enhance the price; there are both red and white wheat in the market; and with the view of making the red wheat as nearly like the white as possible these materials are used. This adulteration is not prejudicial to health, but is adopted as a fraud in order to obtain a higher price for inferior flour. I think the authorities are not as vigorous in the matter as they ought to be; I think it is the duty of the chief magistrate to attend to the interests of the lower orders, but I am sorry to say that is not generally done. I think in all cases where the magistrate has reason to think an inferior article is sold in a particular house, he has a right to satisfy himself positively upon the subject, and I think there should be some easy means of doing so. It is totally impossible, except after very considerable delay; and even with the materials at hand it is very difficult to ascertain the exact ingredients contained in flour, or any matter of that kind. The article of flour is certainly improved in consequence of my having made public the circumstances which came to my knowledge. I have lately discovered a regular trade to be carried on between Cork and some parts of this country in this deteriorated flour. I heard of it from the very parties themselves. There was one description of flour so bad, that it could hardly be used for any purpose. I think it came from Liverpool.

These adulterations are most conveniently detected by the microscope; the one I use was given to me by a scientific man; I think it cost originally about £20; you would get one, I dare say, for 15s. or 20s. that would do. I am a medical man and a chemist myself, and therefore I can examine the flour, or whatever may be in question, with the microscope; but if the mayor was not a medical man, he would have to call in one, and would have to pay him, as there is no fund for the purpose. The market jury are an unpaid body, and unless the mayor happened to be a medical man, or in sufficiently affluent circumstances to take upon himself the expense of submitting articles to examination, there would be no remedy.

Butter is the only article which is subjected to inspection when it is exported. There is a law which renders it compulsory that butter should be subjected to inspection when exported, but it only applies to that article. I think adulteration is not carried on to the same extent it was, and I am quite convinced if the attention of the authorities continues to be directed to it, the practice will be greatly lessened. I invariably take it into my head that, when I see an article offered for one-half its intrinsic value, there is something wrong about it. I have known *opium*, the effects of which are so very salutary in many cases, offered, even in respectable houses, for a vast deal less than its intrinsic value; and I have no hesitation in saying that that is a compound of mixed extracts of liquorice and gentian with pure opium; it is so diluted that it contains one-half of foreign matter; I mean matter which is not opium. I am a dispenser as well as a prescriber, and I do business with the most respectable houses. I have known medical men greatly disappointed in the effects of their remedies, owing to the drugs not being pure. *Morphia* is expensive, and there is no doubt that that is very constantly mixed with powdered opium, which is about one-fourth the strength only; consequently if you give a quarter of a grain as a full dose, you are completely out in your calculation. There is a class of men in this country called grinders; they are the men who produce the powder from the raw material, and it is a well-ascertained fact that in very many instances drugs are greatly adulterated by them. *Scammony tar* is a drug which is very much adulterated; it is an efficient medicine if pure, but from its high price it is constantly adulterated. The adulteration generally consists of common resin. Drugs are adulterated, I believe, very little in Cork. In the first place, they are not adroit enough to do it, and next, the quantity sold in any one house would not induce them to embark in anything of the kind. I think the poor are more exposed than the rich to the supply of adulterated drugs. I know that the guardians invariably take the lowest tender, and many articles which are contracted for are not absolutely paid for by one-half. I mean that an article, the value of which is 1s. per lb. is constantly in those contracts put down at 6d.; therefore it must be a deteriorated article: even if they do not adulterate the articles themselves, those who are chemists deal in London with inferior grinders. The article of *calomel* is very frequently adulterated. I do not think chalk is a common adulteration. The adulteration of drugs by metallic substances is very easily detected by the chemist. The chemists in Cork are generally supplied with medicines from London. The chemist ought to be aware of any adulteration which exists in the articles he purchases. There is no real economy in the guardians contracting to be supplied with drugs at so low a rate as to make it probable they will be adulterated: it is bad economy. The poor are not cured, but remain sick in greater numbers than they would otherwise do. We have an apothecary in the establishment, resident, for the purpose of compounding: we have a physician, who is seldom resident, but who is a practitioner in the city, and who goes there once or twice a day, and prescribes: then there is the druggist in the town, who sells medicines, and sends them to the establishment. The resident apothecary should examine the drugs, and reject them if adulterated; and I have known him report very constantly of the inferiority of the articles, but still there is always a party in favour of the article. I think it is of importance enough, and that adulteration is general enough, to make it necessary that some public officer should be appointed for the purpose of ascertaining whether food is wholesome, and who could be referred to on a suspicion of its being otherwise. I think there ought to be an inspector in every city of a certain population. I think at first he would have occupation enough, but the matter would be remedied after a time, though at starting a moderate salary would be quite sufficient, particularly if he remained on the spot. There is no other remedy which I can suggest for this wide-spread and general evil. I am quite convinced that legislation ought to step in and remedy the evil: it is getting to such a pitch. I have lived in Cork from the age of fourteen, but it is only of late years that I have suspected adulteration to be so general—since I became mayor. People have given me the credit of being scientific, and that was the reason I was particularly appealed to: it is only since the 1st of January last that my attention has been particularly directed to the subject. I obtained Dr. Hassall's book the instant it came out, and I think it is a work which is likely to be of the greatest possible use.

EVIDENCE OF JOHN MITCHELL, Esq.

I AM by profession an analytical chemist, and have published a work on the adulteration of food. My experience goes to show that there is a very extensive adulteration carried on in the leading articles of food. Nearly every substance consumed as food is adulterated more or less. My attention was first directed to this question about eight or nine years since. I commenced a system of analysis at that time, with a view of obtaining materials for the work I intended to publish. After three years' experience, I published the results of my analysis. I will state to the Committee what are the principal articles I have found to be adulterated.

Bread is very considerably adulterated with alum and boiled potatoes, and with inferior flour. Alum is used to improve the appearance of the bread; it renders it whiter: most home-made bread has a yellowish tinge; alum removes that. There is no flour in this country which requires alum to be mixed with it, if in good condition. Any flour which required the admixture of alum I should consider to be in an unfit state for food. With regard to the quantity of alum which is used, I have found as much as from 90 to 100 grains in a 4 lb. loaf. Any addition of alum is injurious; the constant use of even a small quantity of such an astringent as alum must necessarily be so. This is the result of a great number of experiments; I have examined some hundred samples of bread from different parts of the metropolis, taken promiscuously, from the higher neighbourhoods as well as the lower. I found that to be the most usual ingredient in the adulteration of bread; potatoes cause the bread to carry more water after baking. I can scarcely say what quantity of potatoes there would be in a four pound loaf; I have not made any absolute experiment, but I think something like one-twelfth possibly of the wheat flour. From 90 to 100 grains in a four pound loaf was the utmost quantity of alum found; the smallest quantity was from 15 to 20 grains. The average quantity must be about 40 grains. The practical effect of the use of potatoe is, that it makes a four pound loaf heavier, and therefore there is less nutriment in it than if only flour had been employed. I have not found any marked difference between loaves bought in the poorer and in the wealthier districts; they seem to be much alike. I obtained samples both from the high-priced bakers, and from those who sell second quality of bread, and I found the amount of adulteration very much the same. Adulteration with bones is usually practised by millers in the flour; the only additions made by bakers, are those of alum and boiled potato, with the exception of a little carbonate of ammonia, occasionally.

I have also inquired into the state of *flour*. Sulphate of lime and chalk are the two chief earthy ingredients I have found. Those are for the purpose of increasing the weight; they are much cheaper than flour. I have not obtained any flour directly from the miller. I believe the baker gets his flour cheaper in consequence of those materials being used, and that he knows of the adulteration. Any considerable addition might be readily detected, by merely igniting the flour. I believe that the millers supply the bakers with flour at different prices, and that there is some sold at so low a price, that the baker ought to suspect that it is not genuine. The object of the introduction of sulphate of lime is merely to depreciate the value of the flour. I have taken flour promiscuously as I have bread, in the way I described just now, and it had those substances very generally in it. I have never found anything positively deleterious in bread, except alum. I have not examined brown bread. Rolls are adulterated in the same way as other bread. I have not examined any unfermented bread. I know what German yeast it, and I see no objection to its use. I have never met with any which was not pure, or in an unwholesome state.

Beer is an article which is considerably adulterated. One adulteration, which is common to all beer, is the addition of water; the next is the addition of sulphate of iron, alum, and common salt; those more particularly apply to porter and stout. Alum and sulphate of iron are used together to give a head to the porter. The proportions in which I have found sulphate of iron are but small. It is pretty generally used, and would act much in the same way as alum, as an astringent. It does not give any intoxicating effect to the beer; it only gives this apparent strength in the head. I have not found any article mixed with porter the tendency of which is to give an intoxicating character to it. I believe cocculus indicus and some other matters of that kind are employed for the purpose, but I cannot speak from actual experience. It is possible to detect those substances by chemical analysis; but it would be a troublesome inquiry, and even then I do not think an analysis could be pronounced perfectly to be depended on. They might be present without your detecting it. I am not a medical man, and am unable to speak of the effects of those articles. I dare say they will produce the effect of poisoning; whether they would produce colic and vomiting I cannot say. Ales are also stated to be adulterated with cocculus indicus and grains of paradise, the latter for giving pungency. I do not think that is an injurious addition. Chemists are forbidden to sell it to brewers or to a brewer's agent, and a chemist, known to have sold it to a publican, would be liable to be fined. That is easily evaded; he need not sell it to the publican; he can sell it to the publican's friend; I believe it is in that way these things are sold. As the law exists, it is no check to fraud. I got my samples from public-houses and breweries. I do not believe at the large breweries there are any adulterations; I think it would be impossible to carry on adulteration where so many men are about; in small breweries I believe adulteration is practised to a very considerable extent. There are frequently informations laid against brewers, generally for having gentian and grains of paradise and such matters in their possession. I have detected sulphate of iron in nearly every sample of porter I have analysed. The presence of sugar you cannot well determine; there is always a certain amount of sugar naturally existing in beer; molasses and sugar are now used by brewers in lieu of a certain proportion of malt; that is no adulteration, because alcohol is produced just as it would be from the sugar existing in malt. My experience has been very extensive with respect to beer; I dare say I have examined 200 samples at different times. I have got pure beer from the brewers, but I have not found any pure which was sold at the public-house. In all those cases where I have procured beer from the public-house, the samples contained sulphate of iron. I obtained samples at public-houses in different districts, and found the beer more or less adulterated in all. There are different prices charged for the same article; you will see beer at one house sold at 3d., and at another at 4d.; but I have not examined those beers to see which was most adulterated in reference to the price. I have only examined it as a sample of beer, to see whether it was adulterated or not. When the price is very low we have every reason to suspect there is adulteration, though I believe the publicans could very well sell their beer at a low price without adulteration. There cannot be a doubt that there must be an additional profit, when water is sold in such a large proportion, instead of beer.

I have found *gin* very much adulterated, but more particularly with water; it is rather a reduction in the strength of it than anything else. I have not found any cayenne pepper in gin. I would not consider the reduction of its strength an injurious matter, as regards the health of the community, but the consumer would rather reduce it for himself, I presume.

The result of my inquiries as to *coffee* correspond with those of other gentlemen who have given evidence here upon that matter. I have found a large proportion of chicory, and the mixture is very generally sold for coffee. I have only obtained a very few samples of pure coffee, when bought ground. I am speaking of that which you buy as coffee. I do not think the retail dealer can be imposed upon himself, because most of the grocers grind their own coffee; it is not bought in a ground state. In the samples of coffee I have examined, I have found chiefly chicory, roasted corn, roasted roots of other kinds than chicory, and sometimes inorganic matter, such as earth, ochre, and so on. I have detected those ingredients in coffee by the ordinary chemical tests. Chicory and coffee differ very much from each other in their effects upon water. If genuine coffee is sprinkled upon the surface of a tumbler of water, it remains a considerable time floating, and when it sinks it only slightly colours the water; chicory, on the other hand, sinks quickly, and colours the water very deeply. I do not believe there is any ingredient in coffee itself, or anything which is naturally found in coffee, which can be mistaken for chicory; ground coffee is enveloped in an oily substance which prevents the water attacking it; chicory has no such protection, and sinks immediately. I do not think that any chemist could possibly be mistaken in reporting upon the mixture of chicory with coffee, it is so easy of detection. I have heard that there is an article made which is a precise imitation of the coffee-berry, but which is not coffee; but I have never seen it.

I have also examined *cocoa;* that is adulterated very considerably with starch and ochre. I cannot state the proportions; I made no quantitative estimates of those materials; I simply ascertained their presence, and they appeared to be present in considerable quantities. Cocoa is much more consumed now than it was formerly, and is cheaper; but the articles I speak of are of very little value in comparison to the price of cocoa. The ochre is easy of detection, but not the starch, because starch already exists in the cocoa bean itself. The microscope would be the best means of detecting that. The ochre is employed to colour the starch to the colour of cocoa, and to increase the weight. I have examined two or three dozen samples of cocoa from different places, and from different kinds of shops, both large and small. I have found some pure, but in the majority of cases I have found ochre. I have found no difference, whatever might be the character of the shop.

Great progress has been made in the means of detecting adulterating substances. I am aware that in the year 1851 a report was made to the Chancellor of the Exchequer, that four eminent persons had been employed to detect the adulteration of coffee with chicory; but that "neither by chemical tests, nor by any other means, was the admixture of chicory with coffee to be detected." At that time, however, there were just the same means of detecting chicory that we have now. My work was published in 1848, and if I had been referred to, I could at once have told them that that was not the case; that we were not in such a helpless state, but that it was possible to discover the presence of chicory.

Tea is extensively adulterated with other leaves, such as sloe and hawthorn. I speak from the result of experiments which I have made myself. I have ascertained it by comparing the behaviour of leaves of that kind taken from the tree, with certain re-agents, and then that of the tea leaf. I have found marked differences between the behaviour of the hawthorn and sloe leaf, and that of tea. I have come to the conclusion that it was the sloe-leaf which was used, by the leaves, which did not behave in the same way the tea-leaves did, behaving in the way I have found the sloe-leaf and the hawthorn leaf to behave. I have examined seven or eight samples taken from shops in London in which I detected sloe-leaves. The advantage of using the sloe-leaf is that it is a cheaper leaf than the tea-leaf; it has to pay no duty. It has not exactly the flavour of the tea-leaf, but when mixed in small quantities the adulteration is not perceived. I have never met with a sample sold exclusively as tea. It is quite innocuous. I have only found earthy matter in that which is called the facing of the tea. I do not know of teas which have a certain proportion of earthy matter, which are sent here from China in that state. I have heard of lie tea, but have never seen it. I have examined a great many more than seven or eight samples; only that number I found adulterated with sloe-leaf. Besides sloe-leaf the only other adulteration is an admixture of exhausted tea-leaves. I believe, though I cannot speak certainly of that matter, that it is the custom for certain people to call at large houses, such as hotels, and so on, where large quantities of tea are consumed, and purchase that which has been used. It is dried and prepared as the original tea-leaf would be, and re-curled. I have met with instances of this restored tea. I have ascertained the amount of extract furnished by a certain weight of the tea; I have then ascertained how much theine has been in the extract, and from that we can calculate pretty well the amount of extract of tea present, because the average of theine is pretty constant. I do not think from the experiments I made that this was inferior tea, and not tea which had been actually used once; the quantity of theine was so much less than was obtained from any ordinary tea. Taking 16 ounces of mixed tea, the proportion of sloe-leaves or hawthorn leaves I have found was 15 or 16 per cent. I only suspect that there is that kind of traffic going on from hotels in exhausted tea-leaves; I have no knowledge of the fact.

I wish to call the attention of the Committee to *confectionery* and *lozenges*. Most of the colours used, at one time, were highly injurious, being all mineral colours; but I believe, since attention has been called to the matter, vegetable colours are employed almost exclusively. Lozenges have large quantities of chalk, sulphate of lime, and starch in their composition.

EVIDENCE OF ROBERT DUNDAS THOMPSON, Esq., M.D., F.R.S.

I AM Professor of Chemistry at St. Thomas's Hospital, and have had a great deal of experience with respect to various kinds o adulterations. My attention has been chiefly directed to those of drugs, but I can speak of the adulterations of some other articles. I have found a tendency to mix inferior flour with the better sorts of *flour*, which was the principal nature of that adulteration. I have found bicarbonate of soda in *bread*, which I believe is added for the purpose of neutralising the acid tendency in some kinds of moist flour. This was particularly found in American flour when the first importations were made. The bicarbonate of soda was manufactured in this country, sent to America, and added there. That mixture had reference to the voyage out and the land carriage. I do not know that it would have a deleterious effect on health; still it was added to an extent which I would call adulteration. They could not have obtained bicarbonate of soda in America at that time in the quantity which was required. I have not detected alum in flour, but I have found it in bread. I know it is manufactured on a large scale for that purpose; I was told so by the manufacturer. I believe it is not generally mixed in injurious quantities with bread. I have sometimes found Indian corn mixed with flour; and I have been able to detect little more than one-half per cent. by means of the microscope. On one occasion I became acquainted with a case of very extensive adulteration of meal, under a contract with the Government for the supply of the

Highlands of Scotland, where inferior kinds of meal were added to the *oatmeal,* and the discovery of this was made by mere accident. The party was prosecuted, and I think was imprisoned for a year. An inferior kind of meal, which would not sell, was mixed with the oatmeal.

With respect to *arrowroot,* I have found it to be largely adulterated with potato-starch, which I consider a gross fraud. I have also examined *mustard;* it is very seldom that you get that pure. Turmeric is the colouring matter, and various sorts of pepper are employed to give it its peculiar taste. Here is a substance which is very much used for food for children; it is called *manna kroupe,* and is imported from St. Petersburgh; that is, Russian wheat. Here is some *semolina,* which I believe to be from the Mediterranean. These articles are sold in every shop. I have examined samples, and found them very inferior kinds of wheat; and from the descriptions I have seen given of them I believe them to be largely adulterated.

I have also examined *coffee* to a great extent, and have been consulted by the Excise upon the adulteration of coffee; I have found pure coffee to be a very rare substance when bought ground. I have found chicory present in all proportions, according to price; it is a substance employed for diluting, just as a milkman uses water for diluting his milk. The prices of coffee range pretty much in proportion to the quantity of chicory which it contains. Chicory has no nutritive qualities. I think you get worse articles of this kind in the poorer districts than in the richer; and they are not very particular about putting in the chicory only; they will put in anything sometimes; I may mention as an example of an attempt at the adulteration of coffee, that a large cargo of lupines from Egypt was imported, and they could not make any use of them in consequence of their bitter taste. I was consulted upon the subject, and asked to give a certificate in favour of this substance, as being equal to coffee. I examined it, and found it contained a bitter principle, and that it was no more like coffee than brick-dust. But I found, on examining it, that the bitter principle could be extracted by water, and I recommended the party who had applied to me to subject the lupines to the action of water, and told him it would then be serviceable for feeding cattle or pigs, and he used it for that purpose. I am aware that berries are made extensively, having the appearance of coffee-berries, which are not coffee, and I have even seen the apparatus employed for the purpose. It was considered a very ingenious piece of apparatus, and was something like a bullet-mould. I saw the berries produced, and they were a very good imitation. Those artificial berries were said to be made from chicory. I did not analyse them, but I am satisfied it was not coffee. It was pointed out to me as a very clever and a very proper thing. It could be ground in the usual way, and would be very likely to deceive the public altogether. The public might purchase this assumed coffee berry, and find it to be chicory. The berry had the appearance of roasted coffee. I did not see the berry in any form corresponding to the raw state. I am not aware of the manufacture of it; it was the machine that was shown to me. I think it was in London. I think there was a patent for it; at least it was registered, as I was told.

I have some specimens here of *green tea*, one of them is manufactured in Canton; the other is a black tea; there is a chemical substance upon it. If you break the leaf, you will find that it is black tea coloured with Prussian blue. The facing of that tea is injurious to health. It was imported in very considerable quantities, I believe. That adulteration is for the purpose of getting a higher price for green tea than could have been obtained had it been black. It would be imported as green tea; the Custom-house makes no distinction between green tea and black tea in the rate of duty. No inspection whatever takes place on the part of the Government. I have found a substance which is extensively sold for the purpose of making inferior teas appear of a superior kind, under the name of *la veno beno;* that is sold at 6d. an ounce. I examined it, and found it to consist of 14 per cent. of sloe or hedge leaves, and 86 of catechu. I have also examined tea which contains nearly half its weight of iron-filings; the iron-filings of course fall to the bottom of the box with the finer portions of the leaves. I think that adulteration occurred in China; but I believe la veno beno is made in this country on a large scale. The filings of iron were found since the alteration with respect to the importation of tea into this country in 1844. If a person applied a loadstone to the box of tea, he would find a singular effect, as I showed the persons who consulted me as to the means of detecting it. I have no reason to believe that the tea imported now is more adulterated than it was before the alteration of the law. I know they were in the habit of putting in iron-filings twenty years ago. I do not say it was a constant practice; I know it has been done. I do not suppose it was a common thing. I do not speak from any examination of my own, except in the case of this single box, which was brought to me by the Lord Provost of Glasgow. I was told in China that they were in the habit of adding iron-filings. The merchants out there were not aware of it till the tea was brought home. I am aware that prior to the alteration of the law a course of inspection was adopted by the East India Company, but I think if the quantity of iron-filings was small, it might be overlooked. If the inspectors in England discovered it, they would report it to what were called in those days the security merchants.

I have known *sugar* adulterated; there is a pretty general complaint that the finely crystallised sugar is by no means sweet. I have had many samples of this sent to me from the country; upon examining it, I have found it to contain lime along with the sugar. I speak of sugar which has been refined in this country; 10 per cent. of lime will render the sugar perfectly bitter. I do not apply that remark to the raw sugar, as it is imported. I have found this adulteration to exist to the extent of one-half per cent. or one per cent. That adulteration, I think, is owing to an imperfection in the process; it is a chemical compound which the lime makes with the sugar. I do not speak of that as an intentional fraud; I think it is carelessness in the manufacture. I have found lime only in crushed sugar, which has only undergone a partial process of refinement in this country.

With respect to prepared forms of sugar, such as *sweetmeats* and *comfits*, they are adulterated to a very large extent. On being consulted by several parties upon the adulteration, I procured from a great manufactory specimens of different prices. There were about ten different samples: I will first speak of what are called mints, at 7d. a pound; they contained 3·03 per cent. of a substance which is sold to sugar-bakers under the name of terra alba, which I found to be plaster of Paris. The second sample was 84s. per cwt., and contained 20·84 per cent. of terra alba. The third was carraways, at 5d. a pound, and contained 27·82 of terra alba. The fourth, another specimen of carraways, at 8d. a pound, contained 19·22 per cent. of terra alba. The sixth, almonds, at 10d. a pound, contained one per cent of terra alba. The seventh, another sample, at 8d. a pound, contained 7·02 per cent. of terra alba. The eighth sample, at 8d. a pound, contained 22·76 of terra alba. Raspberries, at 9d. a pound, contained 7·76 of terra alba. Strawberries, at 9d. a pound, contained 8¼ per cent. of terra alba. I think the mixture of this terra alba is very injurious, in addition to its being a gross fraud. The effect of plaster of Paris upon the stomach is that of a quantity of rubbish. I have here a substance which was sent to me by a British brandy maker; it is a substance used to flavour these sweetmeats; I find it consists principally of the oil of grain, which is a strong poison. It comes over as it is obtained from the distillation of raw grain. I was told it was used for the manufacturing of some kind of British brandy; it gives a colour and a particular flavour; in fact, it converts whiskey into brandy. The specimen was sent to me by a distiller to ascertain what it was, and he told me it was used for that purpose. It is emyllic alcohol, and is mixed with the salt of amyld. I should not like to take it. It is used extensively in the preparation of what are called pine-apple drops. It contains oil of grain, and is also used in the preparation of brandy-balls.

I have some evidence with respect to adulteration in the preparation of *sausages*. I have heard that sausages are made from horses' tongues; I believe that the tongues of horses which are killed at the knackers' are used; I do not speak from any evidence I have before me. I am rather afraid that other parts of the horse are used also. Horse-flesh would not be more prejudical to health than other flesh if the horse were healthy; it is only if the horse has died from disease, or been killed in consequence of being ill. It is not usual to kill horses in a healthy state.

The comfort and health of the great masses of the people depend much upon good *bread*. I am afraid there is no easy way of detecting the presence of alum in bread; you may judge from its dampness that probably potato starch is present. The best bread, if put into water, would absorb a considerable amount. If two persons desired to compare their bread, they might do it in this manner: each of them might cut a slice of bread, and put it into water; the good bread would absorb much more water than the bad bread.

With respect to the *water* of London, I have a diagram here which represents every grain of foreign matter in a gallon as a degree of impurity. I consider distilled water as zero; as the curve begins to ascend, you arrive at London water. Another diagram represents the different degrees of purity of the water supplied by the different companies in London. Another represents the various degrees of hardness. The Committee will find from the diagram representing the London water, that the quantity of foreign matter at Thames Ditton is less than it is as you descend the river; it seems to increase gradually as you descend. When you come to Vauxhall, we find that the water varies very much. I found it contain, in March, about 23 grains of impurity in a gallon; in September, last year, I found it to contain 72 grains, as supplied to the inhabitants of Southwark; in July, this year, I find it to contain as much as 86 grains in the gallon. On March the 15th, 1855, I found it to contain 23·8 grains of impurity per gallon; on the 7th of May of this year it contained 32·3 grains; on the 7th of June it contained 41·88 grains; and on the 7th of July, 84·94 grains: that was the water supplied to St. Thomas's Hospital, or rather in front of the hospital, at the cab-stand. The reason of that increased impurity, I think, is explained by this diagram; here is represented the condition of the river at high-water, and its condition at low-water: the total amount of impurity taken at Vauxhall at high-water is 110 grains. The influence of the salt water would vary a good deal at different times.

FRIDAY, July 27th, 1855.

EVIDENCE OF ROBERT DUNDAS THOMPSON, M.D., F.R.S., CONTINUED.

I spoke on the last occasion of the results I had obtained from specimens of Thames water taken at different places. The total quantity of impurity at high-water at Vauxhall, comprehending mechanical matter, organic matter in solution, and inorganic matter in solution, was 102·42 grains per gallon. At Hungerford, the total quantity of the same ingredients was 115·68 grains per gallon; and at the Surrey end of London bridge, the same ingredients amounted to 113·24 grains. The samples were taken within the same hour on the same day. It was scarcely high-water, which would account, to a certain extent, for the slightly superior purity of the water at London Bridge; because the sea water would be coming up from below London, and driving the impurities of London up towards Hungerford. At Hungerford there is a great deal more of mechanical movement in the river, arising from the steamboats at Hungerford Pier. The amount of mechanical impurity at Vauxhall was 60·50; organic, 5·28; inorganic, 36·64. At Hungerford the mechanical impurity was 64·64; organic, 5·8; inorganic 45·24; making altogether 115·68 grains per gallon. At London Bridge the mechanical impurity was 63·44; organic, 4·72; inorganic, 45·08; making altogether 113·24 grains per gallon. At this state of the tide a great proportion of the impurity of London would have been carried up by the tide beyond Vauxhall Bridge; so that those particular specimens do not give the Committee any idea of what the water of the Thames is above the metropolis. The total impurity at Vauxhall, at low-water, was 27·14 grains per gallon; at Hungerford, 48·84 grains per gallon; at London Bridge, Surrey end, 32.08; and at Greenwich on the same day, 95·68. The mechanical impurity at Vauxhall, at low-water, was 10·26 grains; organic, 4·34; inorganic, 12·54; making in the gallon 27·14. At Hungerford, the mechanical impurity was 16·80 grains; organic, 8·40; and inorganic, 23·64; making altogether 48·84 grains per gallon. At the Surrey end of London Bridge, the mechanical impurity was 3·52; organic, 7·36; inorganic, 21·20 grains; making in all 32·08 grains per gallon: at Greenwich, on the same day, the mechanical impurity was 3·7 grains; organic, 19·44; inorganic, 72·54; making in all 95·68. Mechanical impurity is that which is diffused through the water, and can be removed by filtration; organic impurity is that which remains in solution, and is not removable by filtration; and inorganic impurity is matter which is not destructible by heat, and is also in solution. The greater proportion of impurity at low water which is found at Hungerford, as compared with London Bridge, arises from the greater disturbance of the water; and there is a very disgusting sewer which passes into the river at the very place where this specimen was taken. The high-water specimens were taken on the 8th of December, 1854, and the low-water specimens on the 2nd of September, 1854. It was dry weather, and had been so for some time. I can give an analysis of the mechanical matter, but made some years previously, in 1850. I believe it gives a pretty good idea of the present time; those specimens are regularly taken up alongside the "Dreadnought" every morning, so that it may be supposed to correspond with the mechanical matter which I have given here as being obtained at Greenwich. In December, 1850, the composition of 100 parts of this substance, after being dried in the air, was, water 9·04, organic matter 21·28, silica and clay 69·68. There was a little calcareous matter, but very little. It appeared to be principally earthy matter, together with siliceous shields of certain kinds of the lower classes of plants and animals. I have no note of the nature of the weather; but as these specimens were taken up and sent to me by the Astronomer Royal, it is very easy to ascertain. The difference in wet and dry weather, in the proportion of calcareous matter, would be very considerable. I have sometimes found the water harder in dry than in wet weather; but it depends, I believe, on the sources from which I have taken the water. If the water has been allowed to stand for a considerable time, it becomes softer, and deposits the lime, and therefore you cannot judge so well whether it is natural to the water or not. This analysis of water at Greenwich was made solely with a view to ascertain the component parts of the deposit or mechanical impurity, and gave no idea of the hardness or softness of the water at that place, softness and hardness being due to the relative amount of matter in solution. The state of impurity of the Thames round the metropolis varies very much with the different states of the weather. In dry weather the Thames contains a less quantity of vegetable and animal refuse than would be due to it, so to speak, at that time, supposing it to be continued as a receptacle for such refuse, and in rainy weather there would be the accumulation of the dry weather hurried into it. In many districts there is no drainage; there are sewers, but there is no communication between the houses and the sewers; and in a very great number of instances I have found that although there was said to be a drain, yet the old cesspool remained; so that the only portion of matter which escaped from the house was the overflow of the cesspool, and of course the quantity of this would increase by the amount of rain. The rapid flow of the water enables it to carry along with it, in suspension, a great deal which in a slow and feeble stream would be deposited along its course; so that a great deal of the foulness of the Thames at particular times may be attributed to the arrears of animal and vegetable refuse which are at such times only hurried into it on account of the imperfect action of the drainage of London at other times. The rain acts, in fact, so as to flush the drains. Unless the detailed drainage of London were improved, we should always be liable, with any system of intercepting sewers, to great volumes of water coming down charged with impurity of that sort. In London and large towns the whole of the rain-fall is very rapidly carried away by the drainage, owing to the hardness and impermeability of the surface on which it falls, instead of being slowly filtered through beds of earth, or running down porous ditches and winding streams, as is the case in the country. One great remedy for the foulness of the Thames would be the regular discharge from each house and street of the impurity produced in it, rather than any attempt at intercepting all that before proper measures had been taken to ensure its regular discharge, either into an intercepting sewer, or into the Thames; I should like myself to see the two plans taken up simultaneously. No intercepting scheme, without an improvement in the daily discharge of the daily-produced impurity of the town, could effectually purify the river.

With regard to the impurity of the water supplied to London, I found in the Lambeth Company's water, which is taken from Thames Ditton, the quantity of carbonate of lime to be 10·144; this water, however, was taken from a cistern, which would soften it a little. Grand Junction Company, 8·870; West Middlesex, 9·919; Chelsea, 9·55; Southwark and Vauxhall, 10·7; New River, 11·985; East London, 11·997; Kent, 9·54. All of these samples, I think, were taken from cisterns. This may be taken as the ordinary state of the water as supplied to the inhabitants at this particular season of the year: these analyses were made in November, 1854. Soap consists in general of 5 or 6 per cent. of alkali, 50 or 60 per cent. of water, and 30 to 40 of fatty acids; five or six grains of lime will destroy 100 grains of soap by turning them into curds; so that the presence of this amount of calcareous matter must cause a very great waste and expenditure of soap. In the preparation of coffee and tea, lime in water precipitates, and destroys the caffeine and theïne; and in dyeing, it interferes very much with the brightness of the colours. Therefore it is quite a mistake to suppose it is a matter of light moment to a large and civilised population, whether their water is hard or soft. I consider it to be a very important point that it should be soft. The Committee have to consider, with regard to the question of the purity of the water, not only the effect produced on health by the presence of animal or vegetable matter in a decomposing state in water, but also the presence of calcareous matter, which causes immense loss and waste to the inhabitants using the water. The supply of water from rivers must be subject to greater contamination than water from springs higher up on the hills; and therefore the river supply, if you can get any other, must be considered as inferior, particularly where the population on the banks is considerable. That would apply especially to the Thames, where, above the metropolis, there is something like a million of population located on the banks of the river, or on the banks of streams draining into it. The Thames at Teddington Lock, or Thames

Ditton, though it may give a better supply as regards quality than you would get near Vauxhall Bridge or Hungerford Bridge, yet gives a supply not only harder from the calcareous nature of the country through which a great part of the Thames passes, but also one which is deteriorated by the drainage into it of the refuse of a very large population, and of many large towns. At present, I consider that all the water which is supplied is more or less impure. At the same time, I think that the subject requires further inquiry, because a great deal depends upon the opinion of the engineers. So far as the chemistry of it goes, I think it is quite satisfactory, and we could obtain much purer water than we have at present. I distinguish what may be called impurities of water from the impurities I have spoken to in other articles, inasmuch as the companies themselves would just as soon supply pure water as impure water, if they could get it. It is not for any pecuniary profit, or any fraudulent purpose, that they supply water of this injurious character; they cannot improve the water with their present powers. I think, however, that they might soften the water. I have understood that the Chelsea Company filter their water, and judging from my experiments upon it, I should say they do. I know a method by which it might be softened at considerable expense; but from data which have been given me, it appears that a great deal of the expense would be met by the sale of the produce of the softening process; there is a quantity of chalk which is formed, of a very fine description, which could be sold. The water so rendered soft would be quite pure, so far as the addition of the lime which is necessary for the process was concerned; it would add nothing to the water, if the process were properly performed, and it would take away certain impurities in the water. At present, unless you could convince the companies that they could do this even with a profit to themselves, there is very little chance of its being done. Not having made a number of experiments on the subject, I am not able to speak to the water at present, but last year the water of certain companies was much more impure than it had been four or five years before. I believe that, in future, all the companies deriving their supply from the Thames will have water of the same degree of impurity; they are all to derive it from nearly the same point, and of course it will be nearly of the same quality. I have examined specimens of water which did not appear to me to have been filtered; and I consider the water supplied by any of the London companies, after it has undergone filtration in a house by a private filter, to be very much inferior to the water supplied to many large towns of Great Britain; it is much harder, and it contains certain substances which appear to me to indicate the existence of sewage in the water. There are springs in London which are free from mechanical impurity, and that is the source to which I referred as being a point which engineers were required to settle. I am quite convinced that the water is an excellent water, but of course I cannot speak as to the abundance of the supply; I can only speak to the chemical character of the water, which I consider to be good. There are also a great many shallow wells supplying the town, and those I consider to be injurious to health. They have no chemical impurity, but they contain large quantities of ammonia and nitric acid, which appear to be derived from surface percolation; and in many cases I have found urine in those wells. With regard to the effects produced by this impure water upon the constitution, I may give an example: in a house on the south side of the river I found water, derived from a well which supplied the house, exceedingly impure, and with a most nauseous smell. The quantity of nitric acid in it was great, and also of ammonia. This water was sent to me for examination, in consequence of the children in the family having been continually complaining of fever. I thought it was possible that the water might have contributed to the effect, and I advised them to shut up the well, which they did; and I am not aware that there has been any complaint in the family since. It is very difficult to eliminate the effects of water from the effects produced by any other cause, but I believe the state of the water contributes to the propagation of disease. Where the water has been good, the cholera, generally speaking, has been less fatal than in other places, and the contrary is the case where the water has been bad. The inhabitants of districts which were supplied with water pumped up from the river within the metropolis, suffered more from cholera than those which were supplied with water taken from other parts of the river.

I have stated that Thames water at London Bridge contains, at high water, 118¼ grains of impure matter in a gallon, and at low water only 32 grains. There is so much less impurity in the river at low water than at high water, because at high water you have the tidal sea water intermingled with the water in the river. Of the impurity which exists at high water, there is a considerable quantity due to the sea water, and likewise to the sewage; because, instead of the sewage being carried away rapidly, it is carried upwards by a tidal wave. I have stated that I believe the water for the supply of the metropolis might be very much improved by the application of lime. I am aware that the amount supplied to the inhabitants of London is no less than 44 millions of gallons a day; but I believe the application of Dr. Clark's process to so large a quantity of water to be entirely an engineering question; I am quite satisfied with the chemical part of it, and I have been assured by engineers who have purified water upon a large scale that it is perfectly practicable upon any amount of water. It has, in fact, been applied on a large scale, at Plumstead, near Woolwich. The boiling of water discharges a large amount of carbonate of lime in the water, but at the same time there is a large quantity remains; the presence of the curd we find in soap, when we wash our hands in London, is due to the presence of lime and magnesia. Filtration by charcoal has also been employed on a very large scale; and though it is an engineering question whether that process or Dr. Clark's is applicable to the water supply of London, or whether the water is to be taken from the Thames or the Surrey hills, or from the chalk, there is no doubt that the application of those two processes, if you get hard and impure water, will remove to a considerable extent that hardness and that impurity. By the Act of 1852 all the companies of London are required to filter their water after this year; and of course any experiments upon the water, drawing comparisons between the waters of the different companies now will, of necessity, be very materially interfered with, and of less value after this filtering process has been carried out. Filtering water through charcoal removes colouring matter, and any decomposing matter which gives out a gas which can be absorbed by charcoal. Water purifies by the process of oxidation which goes on within it; so that though the Thames takes the drainage of three quarters of a million of inhabitants above the place where the water companies now take it, the impurity of the river at that spot is not quite what, without that consideration, might be expected to arise from the amount of animal and vegetable refuse from so large a population. It is impure to a considerable extent, but not so impure as but for this process of oxidization might be anticipated.

With respect to the adulteration of drugs, I believe that it prevails very extensively; and that the adulteration itself is of a very injurious character. It applies to some of the leading articles of the Materia Medica. I have here a specimen of the *white precipitate of mercury* which came into my hands the other day. In St. Thomas's Hospital every drug, before being purchased, is subjected to examination, and we reject every one which contains any amount of impurity. I have a specimen of the pure and of the impure article. You can scarcely detect the difference; they are the same in appearance, but the impure one contains a large quantity of chalk mixed with it. This is used in medicine to a considerable extent, and the result of the adulteration by chalk would be that the effect expected would not take place. All the drugs are submitted to examination at St. Thomas's Hospital, and we have to reject drugs very frequently indeed; I may say that one-third of the substances I have examined I have rejected, either from impurity or adulteration. At one time I was asked by the authorities of the hospital to name a druggist, but not being very familiar with druggists, I made inquiry, and mentioned the name of one who I was told would supply pure drugs. The very first order we gave him we obtained a preparation which contained two or three substances which ought not to have been present; the name of the substance was "liquor ammoniæ," as it is called in the Pharmacopœia; since then all the drugs are sent in by different druggists, marked by letters, so that we keep the best and reject the worst. We have a drug committee; they make out a list of substances required, and we send a copy of that to the best druggists' houses in London, and then we select from the specimens they send in the best samples. In 1838 I gave evidence before a committee of the House of Commons on this very subject, and a great many of the substances which I then pointed as being impure and adulterated, still continue in the market: at that time the subject was taken up with as much vigour as at the present moment. There was no check provided by the legislature, and the thing continues in practice just as it was then. That committee was on the Poor Law Amendment Act, with regard to the remuneration to medical officers of unions. The custom is to attend the poor and supply medicine by contract, and from my general knowledge of the drug trade, I believe they are not likely to be the best. I have been told that there are druggists, at least one druggist, who would sell any powder you pleased at 86s. the cwt. If you asked him if that was the best article, he said it was the best he could sell at that price; the fact being, that he could dilute down by some extraneous matter any drug you please to any value. Sometimes the article does not contain any of the substance by the name of which it is called. I have known *extract of opium* mixed with extract of senna, and from 30 to 60 per cent. of water; that was sold as opium; and if prescribed in any case, would disappoint a medical man. I have here a sample of *scammony*, the purest we have been able to get in London, and yet that contains a large quantity of starch, and to show that starch is not a necessary ingredient of scammony, I have here a specimen without any starch, which I have had for some time in my museum. I draw a distinction between adulterations and impurities in drugs. In the case of some medical substances they are not purified; certain bodies are present in them which ought to be removed, but are not, and those articles in consequence do not correspond with the Pharmacopœia. The manufacture is imperfect without there being any absolute adulteration; but it comes to the same thing. You have a quantity of matter present which ought not to be there. For instance, *carbonate of potash*, a sample of which I analysed, was sent to me as a good article, and it only contained 78·37 per cent. of carbonate of potash. *Rhubarb* is very frequently adulterated with flour and turmeric. I have had examples of that myself in medicines which have been sent abroad for the supply of ships. Where a hundredweight contained 14 lbs. of flour and eight ounces of turmeric, it was considered to be a good article. I threw a large quantity of it away at one time, which was supplied to the East India Company. *Opium*, which has been mentioned here, I believe to be less adulterated than many other drugs. I have analysed the East India Company's opium, and I believe it the purest opium you can get; they have chemists to direct the manufacture. The opium which is adulterated is that which is supplied from Turkey; but it is adulterated after it comes to this country. *Liquorice powder* has been found to be composed of 56 lbs. of sugar, 166 lbs. of barley meal, and 7 lbs. of turmeric. There was positively no liquorice whatever in that article. With regard to tonics, which are used very extensively in medicine, I have found that *citrate of iron* and *ammonia*, which ought to afford 34 per cent. of peroxide of iron by analysis, only contained 20½ per cent. The *tincture of sesqui-chloride of iron*, which ought to contain 30 grains in the ounce of sesqui-oxide of iron, I have found to contain only 25. When I sent it back, I got another, which contained 35 grains in the ounce. In one sample of *hydrocyanic acid*, which ought to have contained 2 per cent., I found only 1·32, and in another sample I found 2·38. It would have been impossible, therefore, for any medical man to have depended upon that; it would not have produced the effects which he intended in the first case, and in the second case it might have produced dangerous results. The *peroxide of iron* I have found to contain alumina and lime; *spirits of nitric ether* I have frequently found to have a specific gravity of ·847, instead of ·834. *Liquor ammoniæ fortis* I have found to have a specific gravity of ·875, instead of .882, and frequently I have found sulphuric acid in it, and carbonic acid, and in one sample I got lime, sulphuric acid, and carbonic acid. *Calamine*, which I recollect being very much used in surgery, but which has been very much less used of late, I have found to be a preparation of baryta, chalk, and ochre; instead of being carbonate of zinc, it contained not a trace of zinc. At St. Thomas's we have a great many samples of that kind, which are all rejected. I have had to send back a sample containing 6½ per cent. of oxide of zinc, and in one case 57·76 of oxide of zinc. Two samples I have found to contain white lead; those, of course, were all adulterations. I have often heard medical men complain that the uncertainty they felt as to the way in which their prescriptions would be made up has greatly embarrassed them in their treatment of their patients; it is a constant complaint. When they write a prescription, they do not know whether the medicine, as made up, will really contain the elements which are there specified. That is a feeling which is pretty general in the profession.

As to the means by which ordinary people can tell whether the drugs they have bought are fine or not, I know of no way but having a public inspector properly qualified to declare whether the drugs are good or not. The knowledge of such an officer existing would have a great effect in preventing fraud. It would be injurious to a man's character to be detected in selling those drugs. I think there might be a great many persons all over the country to whom questions of this kind might be referred, and one or two public officers to whom questions of difficulty might be referred, just as you have in the Excise, of which I have a considerable experience. They have no difficulty whatever in detecting the adulteration of tobacco. The present chairman of the Board of Excise has introduced a chemical education among a certain number of the more advanced Excise officers; they are educated at the expense of the Government, and it has had a very beneficial effect. Whenever they are in any difficulty they refer to some one who has had a large experience. They are ordinary Excise officers, who have passed an examination before their admission to the office. I consider the adulteration of drugs to be very great, and the public are helpless without some such system of inspection as I have indicated. I should despair of any beneficial result from this inquiry, unless some check of that kind is introduced. The principle *caveat emptor* may sound very well in Parliament, but it is perfectly inoperative as regards the adulteration of drugs or food. No one is inclined to victimise himself for the good of the public by taking on his own shoulders the expense, annoyance, and trouble of exposing and prosecuting fraud of that kind. My belief is that it would be a sound economy if some one were deputed by the public to protect it from adulteration in its food and drugs, just as the officers of the Mint protect it from falsification of its money. I conceive it would not only be a great means of preventing fraud, but would likewise conduce to the public health and morals.

Referring to the samples in which I have found such extensive adulterations, I should guard myself by saying that a number of them were not particularly the powders. They were obtained simply by requesting different houses to send in samples. One-third were impure, that is to say, they were not such articles as are directed by the Pharmacopœia. With regard to the other samples, most of them had passed through the hands of drug-grinders. I I can give you 150 cases, and out of those one-third were impure; our drug bill at the hospital may amount to £2,000 or £3,000 a year. I know they did not all come from one druggist; sometimes they were obtained from as many as ten different druggists. In some cases the parties who had manufactured the adulterated drugs gave me the information; they gave, in fact, the prescription for making the article, and spoke of the manufacture of them as existing upon a large scale. There is a gentleman who would be willing to give evidence upon the subject, who has been engaged in the manufacture (Mr. Scanlan); I would recommend the Committee to hear him if they wish to obtain information upon the subject. I am confirmed in my idea that this adulteration is not exceptional by the very general opinion of the profession upon the subject.

EVIDENCE OF MR. THOMAS BLACKWELL.

I AM a wholesale pickle and sauce manufacturer, of the firm of Crosse and Blackwell. Our establishment is one of long standing; I believe it is one of the oldest in the trade. The practice with respect to *pickles* for the last thirty-five years has been to use copper vessels in boiling the vinegar; it requires the vegetables to be scalded first, and then they remain in the vinegar two or three days, so that the vinegar takes up a portion of the copper. The same thing is done two or three days afterwards, and is repeated till the vegetables become of a green colour. You did not get your pickles of a good colour unless the vinegar was boiled several times. The first time that was done it turned yellow, the next time green; and if you wished it to be of an extra good colour you had to repeat the process till you got that bright colour. The object of the process was to take up a sufficient quantity of copper to colour the vegetables. After the articles which appeared in the *Lancet* four or five years ago we abandoned the practice as far as possible. We have had iron vessels made, which are coated with glass, and we had one silver vessel made, but we found silver would not do. The acid and the salt together turned everything black, and we could only use it for that which contained acids alone. We are compelled to use some large copper vessels, but we only boil the vinegar in them once, and therefore the pickles are of a brown colour; we have iron vessels made, enamelled with patent glass;

but we cannot get them made to hold more than from twelve to fifteen gallons. We have had one made to hold 100 gallons; but from the process which the glass goes through the rivets of the iron vessel break, and it is cracked. I think some change has taken place in the colour of pickles made in other respectable houses in the trade; they are not made so green as formerly. We have taken some means of apprising our customers that we have ceased to use this process. In respect to pickles, we attached a label to the bottle, which we continue to use, on account of the bad appearance of the article; at first it was rather prejudicial to us, but since that we have found it rather advantageous. I think the public are not misled as much as they used to be with respect to the green colour. We found a considerable falling off at first, when we ceased to use those means of colouring the pickles, particularly abroad; parties wrote to us to say they requested their goods green as formerly. Now they are satisfied, and we do not have the same difficulty. We have a very large export trade; we employ 200 people in our manufactory. I do not think myself that the effect of that colouring process was prejudicial to the health of the people, provided the parties in the factory were careful. If they were not, I consider it might be prejudicial; it requires a good deal of care. The only other colouring matter that we use is in *red sauces*; in essence of anchovy, for instance. Anchovy itself is of a dark brown when it is imported; and when potted up in a mould it is a very unsightly colour, an unpleasant brown, and it has always been a custom with the trade to colour it, and to make it a bright, handsome-looking sauce; and the proportion of colouring matter used has been in proportion to the depth of colour required to be imparted. The largest proportion to produce a good colour is ten pounds of bole Armenian to 100 gallons of anchovy sauce, which is about one per cent. If it is rather of a brown colour we may use one-third more. We issued a circular to say that we should not any longer sell the red anchovy. We did that on account of the exposure; it is more to our interest to sell a pure article than an impure one, if parties will really take it. There was nothing deleterious in the colouring matter; the substance is sometimes used medicinally, and contains a very large proportion of iron; it is a red earth, very finely powdered, and then washed. We issued a circular to our customers, explaining our reasons for discontinuing

its use in the preparation of our anchovy paste. We have re
information from our travellers that the trade generally object
pure article. I have sent samples to twelve of the clubs we
to ask their opinion; I have had only one reply, and that is
unfavourable; it was said the colour would be objectionable
taste is better, if anything. Red lead has never been employ
us for the purpose of colouring; it would be pernicious, as
other would answer every purpose. Three years ago, whe
Lancet first took up the question of pickles, we did our
gooseberries in the same way as was the custom of the trade,
to say, the liquor had to be boiled in copper to make them
but we immediately gave up the practice, and have not a
them to be done so since. Still I never recollect a com
though I have often wondered that we have not had them, b
when a gooseberry pie was cut it appeared an unnatural gree

I am aware that fish, which purports to be anchovy, is som
by no means anchovy. There is a large quantity of fish im
from Holland which are an inferior description of anchovy.
are a small fish; I cannot say whether they are anchovie
they have no flavour. I do not think damaged fish is used
spectable houses. If we have inferior fish we sell them to
one at the east end of the town, and they are manufactured o
something with. We do not think it is done by the resp
trade. If we had an inferior quality of anchovies, we shoul
them, but damaged fish we should throw away. Amon
various sauces which we prepare is China *soy*. There is n
there but the genuine article. There is no sauce with the exc
of the essence of anchovy, essence of lobsters, and tomato
which has any colouring in it in our manufacture. Soy is im
from China, and I believe is made from sugar and some b
cannot say myself that I ever saw any manufactured in this c
which I believed to be spurious. We have had some trou
other people counterfeiting our sauces; they are made in H
and in Paris. They are quite of a different quality; at the
time we have an instance of a party coming to us and comp
that our stamp has been sent to him at Hamburg in mistal
sent it over to us; as I understand, they are manufactured a
ported there with our name on them. The adulterations
take place in our business are positively injurious to us; the

the consumption less. We should have no objection to a system being adopted which would check them; we should continue to make this essence of anchovy, but I am still of opinion that many parties will prefer the red article. But the less attractive form of the article will be a sort of guarantee to the public of its being genuine, and if the public will only take to it, the evil will cure itself very shortly.

EVIDENCE OF THEOPHILUS REDWOOD, Esq., M.D.

I HAVE been for the last fourteen years professor of chemistry and pharmacy to the Pharmaceutical Society, and for the greater part of that time I have been curator of the museum to the society. The museum consists of specimens of drugs and medicines in the different states in which they are met with in this country, and also abroad. It is, at the present time, the most extensive and complete museum in existence, whether in this country or any other, in regard to the variety and value of the specimens. I have had considerable opportunities during the formation of this museum, and also from my position as professor there, of observing the quality of the drugs which are used in the country. The members of the society are in number about 3,000 or more, and I am frequently applied to by them, in cases of suspicion, as to the adulteration of drugs. I may say, moreover, that the subject is one which has constantly occupied the attention of the society; it has been discussed at its meetings, and all those connected with it have promoted in every way the bringing to light cases of adulteration. This has extended through the period I have mentioned. I should wish to make a few observations in reference to what struck me in some of the evidence which has already been given before this Committee. It has appeared to me that there has not been a sufficient distinction drawn by the gentlemen who have given their evidence here between impurity and adulteration. An article may be impure without being adulterated. With reference to the chemical products which are used in medicine, and which are also used in the arts and manufactures, absolute purity is unattainable, or it is attainable at a cost which renders it undesirable. As a general rule, they cannot be got in a state of absolute purity. Now, the degrees of purity of such substances, as they are met with in commerce, will chiefly depend upon the nature of the demand for them, and the means for their production. The articles will be produced in such a state of purity as will suit the particular purposes to which they are to be applied; and we find the production of those articles is considerably influenced by the nature of the demand for them. I will illustrate this especially by referring to two processes which have been very generally introduced into this country of late years, and which have exercised a very material influence upon the quality of chemical products. One is that of electro-plating, the other is photography. In electro-plating a salt is very extensively used, called the *cyanide of potassium*, but for that purpose it is not necessary that it should be in a state of purity, and the consequence of there being a large demand for electro-plating has led to its being produced at a much cheaper rate than it was previously, but in a much less pure state. As it is now produced it is quite suitable for the purpose for which it is intended. It is principally employed for electro-plating; and the electro-plater looks principally to the cost of the article. It has been brought down to a low price, and in so doing a comparatively impure article has been produced, and this has, to a great extent, superseded the purer specimens which were generally met with, because principally it was previously used in medicine. I am aware that in carrying out the cheap process for its production, which is known as Liebig's process (for it was Professor Liebig who first suggested it), some manufacturers have produced what is called cyanide of potassium, in which cyanide of potassium is the exception, and all the other ingredients far overpower it. Such specimens would not be applicable to electroplating, because, when it is used for electro-plating, though it is not necessary that it should be pure, it is only the cyanide of potassium which is contained in it that is available. Therefore a pound of cyanide of potassium, containing 50 per cent. of the article itself, would have a value which would be proportionate to the quantity of cyanide of potassium contained within it. There is no doubt, and it is an admitted fact, that the use of this article for this purpose has led to the general adoption of this process, and to the deterioration of the product. Cyanide of potassium, at this present time, is very rarely used in medicine. Previously to its introduction into electro-plating it was occasionally used for the production of hydrocyanic acid, and for that purpose it was very important that it should be in a state of purity; it is now very rarely used for the same purpose, and the pure is sought for. But if any gentleman were to send to a retail chemist's for cyanide of potassium, the chances are he would get it impure, because it is for that the great demand is. Even now, by the retail chemists, in ninety-nine cases out of a hundred, it is sold, not for use in medicine, but for use in the arts, and the impure article for that object answers the purpose quite as well, and, in relation to the quantity of real cyanide of potassium contained in it, is much cheaper. The commercial value is about 3s. 6d. a pound; the pure cyanide of potassium cannot be got at less than about 1s. 6d. an ounce. I mention this to show that the degree of purity of this product would depend upon the nature of the demand. Here the demand is for a cheap article, in which purity is not essential.

I was going to mention another process, namely, that of photography, in which it is very important that all the chemicals used should be in a state of as great purity as possible; and the extension of the process of photography has tended very greatly to improve the condition in which the chemicals used are met with in this country. I may refer to acetic acid, bromide, iodide of potassium, and pyrogallic acid; these are all required in photography, and as they must be pure, they are now in a much greater state of purity than they were before photography was introduced. The influence of the demand has improved the quality of the product. When the demand is for a very pure article, and where it is necessary to be pure, then we may rely upon getting a pure article. But in a case of indifference there is less vigilance, and then the impurity may be to a great extent. I have no hesitation in saying that there is not the slightest difficulty in getting pure drugs in any part of London, or in any part of the country. I wish further to state that it appears to me to be incorrect, and even absurd, to refer to impurities in such substances as carbonate of soda, carbonate of potash, nitrate of potash, Epsom salts, and the body which I have just mentioned, cyanide of potassium, as instances of adulteration. Those impurities I do not look upon in the light of adulterations; they are the result of the adoption of cheap processes for their production. Those articles as they are met with in commerce are in a sufficient state of purity for the purposes for which they are required; and greater purity in those substances would, I conceive, be purchased at a cost which would be quite disproportionate to any improvement in the qualities of the substances. I will give an illustration of what I mean; I am now speaking of the use of these substances generally, because it must be borne in mind that they are used for other purposes besides medicine. I will take the case of *carbonate of soda*, which is made upon an immense scale in this country. It is used very largely, perhaps most extensively, in the manufacture of soap. If any law were enacted which should oblige manufacturers of carbonate of soda to produce it in a state approaching to chemical purity, the price would be so disproportionately enhanced that it would be a great injury to the public at large. Carbonate of soda, as it is met with in commerce, is certainly never pure. The process which is adopted is inapplicable for the production of the pure product. It is pure enough for the purposes to which it is applied; and even when carbonate of soda is used in medicine it answers every purpose that a medical man requires, and in no instance, I am quite confident, does any injury result from the impurities which are present, that is to say, provided the dispenser exercises the ordinary care and supervision which is generally exercised by all respectable dealers. I may state that I was educated as a chemist and druggist. I have been connected with the practice of chemistry and pharmacy for more than thirty years. I was apprenticed originally in the country, and know what the business of a country druggist is. I lived for many years in one of the largest establishments in London. I have also been engaged to a certain extent in manufacturing operations, and for the last fourteen years I have been a teacher. I have been engaged in the education of a large number of young men at the Pharmaceutical Society. Many hundreds have been under my tuition. I know pretty well what the qualifications of those young men are when they come up from the country, and what their qualifications are when they leave and establish themselves in business.

With respect to the substances I have mentioned, which exist in commerce in very variable degrees of purity, for medical purposes the purest descriptions are generally used. But there are other purposes to which they are applied where purity is not necessary. For the purposes to which they are applied they are pure enough ·

and in no case, even in the administration of medicine, is absolute purity required; and I may justify that by referring to the Pharmacopœia itself. The College of Physicians do not require absolute purity; they admit impurity in the tests they give for those articles. They are tests only which are intended to apply to certain extraordinary impurities, and not the ordinary impurities which are commonly met with. There are specific applications which are made of such substances as I have mentioned, for which perfectly pure, or as nearly pure as possible, products are employed; analyses for example; and it is always customary to prepare carbonate of potash and carbonate of soda by special processes for that special purpose. Dr. Normandy stated, that carbonate of soda is adulterated with sulphate of soda; I do not consider that an adulteration, simply because carbonate of soda cannot be obtained without it by the process which is commonly adopted. *Carbonate of potash* was stated to be adulterated with chloride of potassium; it is well known that it cannot be got free from it by the process by which it is produced upon a large scale. When it is first obtained, it consists of carbonate of potash, sulphate of potash, and chloride of potassium. It is purified to a certain extent by adding a small quantity of water to it, which dissolves the carbonate of potash and sulphate of potash, but leaves the chloride of potassium; we cannot deprive it of that small quantity of chloride of potassium, and the Pharmacopœia allows its presence. We could get pure carbonate of potash by another process, but it would be a very expensive one, and it is quite unnecessary, for we now have it pure enough. There would be no advantage, for the purposes to which it is commonly applied, in getting it in a great state of purity; at least, no advantage which would be proportionate to the increase of cost. There is a great difference in the carbonate of soda which is sold in different shops. In chandlers' shops, where it is sold for washing purposes, it contains a large quantity of sulphate of soda; but the price generally is in proportion to the deterioration in the quality, and the demand for it will depend very much upon the effect which the people who use it find to be produced by it. They can buy that common soda for less than a penny a pound, and if it were purified the price would be enhanced beyond the increase in the improvement of the quality. That which is used in medicine is of a purer description than that which is sold to washerwomen. I have no doubt that in some isolated cases carbonate of soda is met with as sold for use in medicine which is deficient in purity; but as a general rule, I believe, as it is sold by respectable chemists and druggists, it is sufficiently pure. Medicinal substances sold in low neighbourhoods are occasionally met with in an adulterated state, but there has been for many years past a great improvement in this respect; they are very much less adulterated now than they were some years ago. I consider that the proper remedy is the improvement of education and knowledge in the parties who deal in those articles, and those who consume them. Better information on the part of the public is wanted. I think the fact should be brought more prominently under their notice where there is a great competition in price, that if they run the price down the quality will, as a general rule, become deteriorated. There are differences in quality, unaccompanied by what may be termed impurities, in reference to the great mass of drugs; in fact the whole of them. Drugs which are of vegetable origin vary very considerably; rhubarb, jalap, and all ordinary drugs. Without resorting to adulteration you may get quite as great a difference in quality resulting from natural imperfections. In reference to drugs as well as most other articles, the public are accustomed to appreciate them, in a great measure, according to extrinsic qualities, and they very frequently overlook the more important qualities; in the case of soda, increased purity in the article is purchased at a cost which is greatly disproportionate to the improvement in the quality of the article; if, for instance, you were to take a shilling's worth of impure carbonate of soda, and a shilling's worth of pure carbonate, the former would contain more available matter than the latter; therefore the man who wants to get the most for his money will buy the cheapest and the least pure article; he gets a larger quantity; and I do not conceive, therefore, that it would be at all to the advantage, but greatly to the injury of the public, and the lower classes especially, if there were any law which prevented the sale of any articles than those which were in a certain state of purity. Soda is sometimes taken to neutralise acid in the stomach; there may be a disparity in the quality of the article which may be used; one takes as much as produces the required effect, and if it were important for a man to get the greatest possible amount of effect for the money it would be to his interest to buy the impure soda and not the pure. I admit that if a man is prescribed fifteen grains of the pure article, and takes the prescription in a place where the impure soda is sold, that is likely to have a very different effect; but I do not believe that one-fourth or one-tenth of the drugs which are consumed in this country are used in dispensing prescriptions. A large proportion of the drugs which are used are used by persons who have no prescription; for instance, persons buy rhubarb and jalap, and doctor themselves. The greater part of the cheaper medicines are disposed of to persons who buy them and will have cheap drugs, and if they get them cheap, the quality will be, as a general rule, deteriorated in proportion; they will have to take a little more. Sometimes those persons get their advice from the chemist, who is always dealing in those things, and knows, or ought to know, what the properties of the drugs he deals in are, and he will speak of the rhubarb as being a purgative of a certain description, and that it should be taken in certain doses. If he knows it is impure, he prescribes a larger amount of what he sells.

With reference, however, to such substances as rhubarb, and jalap, and scammony, there are qualities of an extrinsic nature, which enhance the price. For instance, you may have two pieces of rhubarb, each of which would be equally active; but the one would have a higher cost than the other, because it would possess extrinsic qualities. It would have a compact texture; it would have a certain mottled appearance when cut through, and it would, in consequence of possessing those extrinsic qualities, command a much higher price than another piece which would be deficient in them, though it might possess as much activity as the previous one. If you go into some localities where the poor are supplied with their family medicines, you will find they must have cheap drugs, or they will not have any, and I conceive it would be a great hardship if they were deprived of the opportunity of buying rhubarb or jalap, which being deficient in extrinsic qualities, can be purchased at a lower price. I hope it is not understood that I am attempting in the slightest degree to deny that adulterations exist, or to justify adulterations; but there are a very large number of commercial men, and men of high standing and position, who are looking with great anxiety to what goes forth to the public from this Committee. Up to the present time a great deal which has gone forth has tended, as I conceive, and many others competent to judge conceive, greatly to mislead the public. I have here a specimen of *precipitated sulphur*, a substance which contains about half its weight of sulphate of lime. One of the processes by which it is made yields that product. What was sold at Apothecaries Hall, and described in the *Lancet*, was of that description up to the other day. This has been described as an adulteration with chalk. I have a long explanation to give in reference to some few cases of that description, as to which the public are completely misled.

It appears to me that it is very important to make a distinction between fraudulent adulteration and conventional adulteration; a case such as has been just referred to is a case, according to my notion, of conventional adulteration. It is the result of the conventionalities between the manufacturer, the retailer, and the public; the public have been accustomed to have an article of a certain description under a certain name. For some years an alteration in the mode of making milk of sulphur has been prescribed by the College of Physicians, and what is now designated precipitated sulphur ought to contain no sulphate of lime; therefore, if you were to go into any of the first establishments, and large chemical houses, and ask for precipitated sulphur, they would give it you without any sulphate of lime; but the public going there will frequently require that which does contain it. The difference in use is that the one mixes readily with water and the other does not. The public have been accustomed to the one kind, and a large proportion of them still object to receive the other, which is true precipitated sulphur, because it does not possess the properties they are used to. The complete introduction of the purer article, where it is ordered under the name of precipitated sulphur, has not taken place; I think in some localities there are druggists who, if they were asked for precipitated sulphur, would give you that containing sulphate of lime still, even if it were ordered by a prescription, because the knowledge of the change has not yet reached them. The purer description would be the more active of the two; but there is nothing injurious in either. The regulation as to the precipitated sulphur not containing sulphate of lime was not in the Pharmacopœia; it was in a Dispensatory that was altered. There is no regular or proper authority for it.

TUESDAY, JULY 31ST, 1855.

FURTHER EVIDENCE OF THEOPHILUS REDWOOD, ESQ., M.D.

I WAS anxious at the last meeting of the Committee to draw a distinction between impurities and adulterations, and I referred to some chemical products which are very largely produced and used in this country, and pointed out that in the production of those articles processes are adopted, which have for their object to produce them in a sufficient state of purity for the purposes for which they are intended, at the lowest price at which they can be manufactured. I instanced carbonate of soda, carbonate of potash, nitrate of potash, cyanide of potassium, and Epsom salts. Perhaps I may be allowed, before I proceed, to explain the distinction between carbonate of soda and the substance which I have reason to believe some members of the Committee had in their minds, namely, bi-carbonate of soda. Carbonate of soda is largely used in manufacturing operations, but little in medicine. It was that to which I was referring. The bi-carbonate of soda is very frequently called carbonate of soda in common language, but it is distinguished by chemists as bi-carbonate; it is that which is principally used in medicine. I wish to resume the subject this morning by referring to the kind of carbonate of soda which is principally used in medicine, which we call *bi-carbonate of soda*, or sometimes sesqui-carbonate of soda; it is a white powder, used as an antacid. It was mentioned by a previous witness as one of the substances which are subject to adulteration; and it was included in a list in which also were mentioned bi-carbonate of potash, calomel, mercury, iodine, and magnesia. With reference to those substances, it will be recollected that as regards the chemical products to which I referred at the last meeting, I admitted that they are frequently in a state far from pure, but sufficiently pure for the purposes for which they are intended. With reference to the substances now under notice, I consider that in the state in which they are commonly met with in commerce, they are in such a condition of purity that no exception can be taken to them; and I speak of that as the general rule. The exceptions are so rare that I doubt if they would constitute one per cent. of the whole number of cases. I will first of all take carbonate of soda, popularly so called, the bicarbonate of soda of the chemist. According to my experience, as met with in commerce this substance is in a great state of purity. I have never met with an instance, and I never heard of an instance in which it was adulterated. If you were to begin at Hyde Park-corner and go to the end of Whitechapel, and get a specimen from every shop on your way, in ninety-nine cases out of one hundred the article would be so nearly pure that no chemist could take exception to it. I beg to state in confirmation of that, that since the last meeting I have taken the pains to collect specimens of that article from different parts of London, sending especially to all the low neighbourhoods about Whitechapel, Blackfriars-road, Camden-town, St. Giles, Seven Dials; all the low neighbourhoods of London. I have obtained forty samples, and in no one of them was there any appreciable amount even of impurity. I did not send in my own name, nor was it stated in any one instance for what purpose it was required. I must at the same time in fairness admit, that since the last meeting Dr. Normandy brought me a sample of bi-carbonate of soda, and requested me to analyse it. I did so, and found it contained 12 per cent. of sulphate of soda. He asked me if I thought that was an adulteration. I said I did not consider that it was an adulteration, but it was an amount of impurity which rendered it unfit for use in medicine; that there was nothing in it injurious, but to the extent to which sulphate of soda was present, carbonate of soda was absent. He explained to me the circumstances under which he got it. He said he went to a neighbour of his in Judd-street, and purchased some carbonate of soda, which, on taking home, he found to be pure. He asked the gentleman if he could refer him to any place where he was likely to get what was impure, and he was directed to some little street running out of the New-road, near Battle-bridge, and there he purchased some. That was impure to the extent to which I have stated. But I sent into the same neighbourhood, though I do not know that I sent to the same shop, and no one of the forty specimens procured by me from that and other neighbourhoods contained any appreciable amount of impurity. They were some of them a little deficient in the proportion of carbonic acid they should contain; but I ascribe that to their having been put up in paper, as from exposure to the air carbonate of soda would lose part of its carbonic acid. But carbonate of soda, properly so called, the bi-carbonate of chemists, as sold in this country, is irreproachable; it is made by large makers such as Muspratt, and it is sold at such a price that there is no object in this adulteration. The price paid for these samples varied from 1d. to 2d. an ounce. All of them were equally pure. The circumstances of the locality may account for the variation in price; there is in some neighbourhoods a greater competition than in others. Carbonate of soda used to sell at 4d. an ounce, but it has been greatly reduced in price; it might be sold even at less than 1d., but there is no object in cutting down the price below that. The value of the sample shown me by Dr. Normandy as a medicine would have depended on the proportion of carbonate of soda contained in it; it contained 86 per cent. The only objection to the presence of sulphate of soda is, that if a medical man had ordered twenty grains of carbonate of soda, it would in this instance be giving eighteen grains only.

I purchased some of the samples myself, but not the whole of them. My two assistants were engaged in procuring them, and brought them to me with the addresses. I have no reason to suppose that a different description of medicine is sold to poor persons from that which is sold to persons having the appearance of being in a different position of life. There may be such a difference as this: in the case of rhubarb, for example, there are two varieties commonly sold, Turkey and East Indian; the Turkey rhubarb is dearer than the East Indian, and a poor person would probably purchase the East Indian, which, however, is quite as efficacious as Turkey rhubarb. I believe my assistants were not known in any of those places from which they obtained the samples. In buying the carbonate of soda they purchased at the same time some calomel, and they were always questioned as to the purpose for which it was intended, and whether they knew how to use it. To the best of my belief they did not tell the real purpose for which it was required. I particularly questioned them upon that point, and they said that in no instance did they state for what it was intended, or for whom it was purchased.

It has been stated that *calomel* is adulterated with as much as 60 per cent. of carbonate of lime or sulphate of baryta; now, according to my experience calomel is not adulterated, and as met with in commerce it is in a great state of purity. I consider it to be irreproachable. I obtained 51 samples from the same localities as the soda was got from, but some of them had been procured before I gave the instructions for the carbonate of soda also to be obtained. The quantity of calomel purchased in each shop was 20 grains. I may state that in the localities which have been referred to as those in which the adulteration of drugs principally exists, medicines are rarely dispensed from prescriptions. In reference to the majority of the druggists from whom those specimens were got, they would not have a prescription once a-week, or some of them not once a-month, to make up. Their business consists in selling drugs to poor people, who doctor themselves. They get a little advice with the medicine from the druggist occasionally, that is to say, if they buy rhubarb they inquire how they are to use it, if they do not know; therefore it is for domestic use that those things are sold. That is almost the whole of the business of those little druggists in such localities as I refer to. These 51 samples of calomel were all examined by me, and there were none of them adulterated. One contained a little oxide of iron, and two others a trace of oxide of iron. This, of course, would not be for one moment set down as an adulteration; it was a slight impurity arising from the manner in which the calomel is made, it being sublimed in iron vessels; but with the exception of this one sample, and the two which had a mere trace, the others were in a condition approaching to chemical purity. That confirmed my previous opinion, that there is no country in the world where calomel is so well made as it is in this country. English calomel is celebrated everywhere for being pure.

The process by which it was made abroad was introduced into this country, and the makers of English calomel are much above the practice of adulteration. Those who retail it have no sufficient object in adulterating it; a pound of calomel would last a little shop, such as I have referred to, a twelvemonth or more. That pound of calomel costs him 3s., and he sells it out in quantities of two grains or three grains up to 20 grains, and he gets thereby a large profit upon it; what motive has he or any one engaged in the commerce of it to mix with it 20 or 30 per cent. of foreign matter?

Iodine was another article which was mentioned as being adulterated; it was represented as being adulterated with water and black lead. I have made diligent inquiry among men who deal in iodine on a large scale, and they all assure me that such a thing as adulteration with black lead has never come under their notice. It has been mentioned in some chemical books as having occurred on the continent; but I may say that cases of that description get chronicled. If an adulteration of that description is once detected, it finds its way into chemical books, and is referred to for half-a-century afterwards, though it may never have happened more than once. I asked for information from those who were most likely to possess it with reference to the article as it came into the hands of the manufacturer. If they knew of it, it would be to their interest to state that adulteration existed, because it would be a fraud upon them; they are persons who are manufacturers, and use it in manufacturing operations. In fact, it is not sold in a state in which it could be adulterated; it is in a purified state, sublimed. Iodine in its crude state, as it would be met with in the wholesale market, contains variable quantities of water. Crude iodine comes to London from Glasgow and from Ireland, where it is manufactured, in little barrels or kegs, and it is in a more or less moist state. That water is an impurity certainly, but it is freed from that water before it passes into the hands of the retailer; it is sublimed, and it is sublimed iodine which is used, and that is not liable to the adulteration which has been mentioned; it is a perfectly dry substance. Water would at once bespeak its presence, and the iodine would be unfit for use. Black lead might be mixed with it certainly, but if it were it would completely alter the character of the iodine; it would be at once evident to the senses, and no man who was acquainted with his business would be likely to be imposed upon by any such fraud as that. The customer might be, but I apprehend that no one who has given evidence here would pretend to insinuate that those who are retail dealers in those articles are adulterators, or that they are cognisant of the adulterations, even where they exist; if so, it would be very far from the truth, I conceive. I conceive that their position places them, generally speaking, above suspicion.

Chemists and druggists are a highly respectable body of men; I believe they have done much towards checking and exposing adulteration; all which has been done has been principally done through them; it is they who are constantly finding out cases of adulteration and exposing them. If adulterations take place they take place in the goods before they reach their hands, and they are the parties who are imposed upon as well as the public. The principal origin of adulteration there is no doubt is competition; the public will buy where they can get things cheapest. The retailer goes to the wholesale man and says, "I must sell at such a price, you must supply me at such a price." The wholesale man supplies the best article he can for the price the public will pay; the retailer is not aware that in those cases he is selling an adulterated article, and very frequently even the wholesale dealer may not be aware of it. The greatest amount of adulteration in drugs takes place probably at the mills where the drugs are powdered. Drugs generally do not admit of adulteration in their original state. The great majority of drugs are of vegetable origin, and in the state in which they are brought into this market they do not admit, generally speaking, of adulteration. When they are reduced to powder the detection of the admixture of foreign matter becomes much more difficult, and it is drugs which have been submitted to such a process that are principally adulterated. That adulteration has taken place to a very great extent, but for many years chemists and druggists have set their faces against the practice, and much has been done towards mitigating it. A practice existed in this country a few years ago, and up to the present time it exists to a certain extent, that the drug-grinder has to return to the wholesale druggist within 4 per cent. of the quantity of the drug which was sent to be ground; so that if a wholesale druggist sent 112 lbs. of jalap to be powdered, he would expect to receive back 108 lbs.; it was a conventionality between them; it was the rule which been adopted, and I believe it was adopted with this object. There were, in fact, two objects in adopting it: one was, that previously to the adoption of that rule there was a constant source of dispute between the grinder and the wholesale druggist. Those drugs are in very variable conditions in their original state as to moisture, and lose variable quantities of matter in grinding. In one case, if 112 lbs. of jalap were sent to be ground, the grinder would probably send back 104 lbs., in another case 100 lbs.; and the wholesale druggist would frequently complain, and fancy that some of the jalap had been purloined. At last they came to an accommodation between them, that they should strike an average, that in all cases 4 lbs. on the cwt. should be allowed for loss in grinding. That is popularly called the 4 per cent. system, but the centum is in fact 112 lbs. The difference was made up, no doubt, by the introduction of inert matter. The process of drug-grinding is effected by means of what are called stone runners—a mill consisting of two large cylindrical stones made to trundle round a central axis. When the mill has been used for grinding one substance, before it is employed for grinding another, that has to be cleaned out, and the process consists in grinding sawdust in it. Sawdust is put in and ground till the mill becomes clean. I have reason to believe that the inert matter with which the quantity of those drugs was made up was this sawdust, which was a necessary material in the drug-mill. The other motive to the adoption of what was the general practice till quite recently, was, that wholesale druggists are accustomed to have an established relation in their price lists between the drug in its crude state and the drug in its powdered state. Thus, for instance, a wholesale druggist will send out a price list, in which he will quote jalap root at 2s. 8d. a pound, and jalap powder at 3s. 2d.; the difference between the raw material and the same material powdered would be generally 6d. a pound. Now, in order that he should secure himself against loss, it would be necessary that there should be some uniform relation between the quantity of matter before and after it was powdered; and those two I consider to have been the sources of the practice. I have taken a great deal of pains myself, and I have contributed much to the exposure of the practice; and, to a great extent, it is falling into disuse. Since attention has been directed to the subject, some of the wholesale druggists have fitted up mills to grind their own drugs. I know of no case in which a man who is known by the profession as a drug-grinder, deals in drugs; they do not generally deal in them, but wholesale druggists have made themselves grinders with a view of protecting themselves against that fraud. Two of the principal drug-grinders in London at the present time have entirely repudiated the practice, and another has almost entirely relinquished it, and adopts it only in special cases when he is required by his customers to adhere to that practice. I believe that many drug-grinders are highly respectable traders, who would be very glad entirely to do away with what they feel to be an evil. I must admit that among retail druggists practices of this description are sometimes resorted to. In making some of their preparations—tinctures, for instance—they will sometimes not use quite the full amount of spirit; where proof spirit is ordered in making a tincture, they will put rather more water than will be consistent with the production of a spirit of that strength; but as to any systematic adulteration of drugs, I conceive that the retail dealers are not at all chargeable with any such practice, even in the smallest shops in the poorest districts. I do not apprehend that those who make their tincture with spirit rather weaker than is ordered get a better profit; but it is adopted in those localities where there is competition, and they sell at a lower price.

Among the generality of drugs there is a great disparity in point of quality; if you were entirely to put a stop to adulteration you might have as great a disparity in the quality of medicines as you have now; none of those drugs are in an uniform state. Nature does not present us with those things always in the same condition; nature is, in fact, by far the greatest adulterator. If you take jalap, or rhubarb, or myrrh, or opium, or any of those things which are derived from the vegetable kingdom, you can never get two samples which are identical; those articles come to this country differing very much in quality; it requires the exercise of much skill and experience to select the better class from the inferior. When a chest of jalap comes into the market, it is always sorted; an original package of jalap root will consist of good, bad, and indifferent, and a merchant makes an assortment of those; he selects the best pieces for those customers who are willing to pay the best price; there is another portion, somewh inferior in quality, which will fetch a lower price, and there will be some portion of the chest which will be very inferior, which is sold at a low price to the poor. Where drugs of inferior quality, or adulterated drugs, are sold, it is because the public will get them at a low price; it is to meet the competition in price that this principally occurs. If you go into any respectable neighbourhood, to any well-educated, respectable druggist, you have no difficulty in getting drugs of the first quality. Much has been said of Apothecaries' Hall, as if they had some exclusive privilege for the sale of good drugs; but the drugs are no better there than they are in hundreds of other respectable establishments. There is no doubt, in reference to *cod-liver oil* and other substances, that medical men do recommend their patients to go to particular establishments, where they feel confidence, not that those medical men, in the majority of cases, have any evidence that in other cases the drugs would be adulterated, but simply that they know a particular individual or a particular establishment, and they have confidence there; they do not know others, and they have heard a good deal said about adulteration, though they have no positive knowledge on the subject. Generally speaking, they are very deficient in positive knowledge upon the subject; they know that the efficacy of their medicines greatly depends upon the quality of them, and they are therefore anxious that they should be got from a place where they have confidence that the medicines will be pure. There are many establishments in London and in the country also where they make their own cod-liver oil, and in those establishments they can be quite certain that the article is genuine. There is a great deal of cod-liver oil imported into this country from Newfoundland and from other places, which is quite genuine; it may, nevertheless, be not quite so good. It is not, generally speaking, so free from flavour as that which is prepared in this country. There is a great difference in quality, and I believe there is some adulteration, but I do not believe that that adulteration is extensive.

With respect to *sarsaparilla*, I do not believe that to be very generally adulterated. I believe it to be very possible to obtain pure decoction of sarsaparilla; there is a great difference in the quality, but I believe it is all sarsaparilla. There is a great difference in the price; the sarsaparilla which is most highly approved is Jamaica sarsaparilla, which is much more expensive than Honduras or other sarsaparilla. I do not know of any cases in which a great portion of the sarsaparilla consists of liquorice. I have made many analyses of drugs with a view to detecting adulterations, previously to the appointment of this Committee; I have been engaged in that inquiry constantly for the last fourteen years. I am frequently appealed to by members of the Pharmaceutical Society. I may state that since the establishment of the Pharmaceutical Society, one of the charges which has been urged against that society by some of the merchants in the City is, that it has made their customers much more troublesome than they were before. Since the establishment of the Pharmaceutical Society a much greater amount of information has been diffused among chemists and druggists; they are constantly inquiring into the purity or adulteration of substances which are supplied to them by wholsale druggists, and I am frequently referred to by members of the society in cases where a dispute arises as to whether an article is pure or not. The majority of chemists do not analyse the drugs they purchase themselves, but judge of a drug according to the price which is asked for it. That is the practice in the majority of cases; but the number of druggists who are quite capable of analysing their own drugs, and who make a constant practice of doing so, has very greatly increased within the last ten or fourteen years; and at the present time there are a large number throughout the country who are accomplished chemists, quite as competent to examine drugs as I should be myself, or as any gentleman who has given evidence here would be. I heard the statement made by Dr. Thompson, to this effect, "I have been told that there are druggists, at least one druggist, who would sell any powder you please at 36s. per cwt." I am not able to contradict that statement, and I have reason to believe to some extent it is true; perhaps not to the full extent; but there is a good deal of foundation for the statement. It amounts to this: there is a large chemical manufacturer in this country who has stated, that if an order be brought to him for an article at a certain price, he considers that his conscience is absolved from all responsibility, and that he will supply an article at the price which is quoted, producing the best thing he can; on the man who gets it he puts the responsibility. Articles were at one time very largely exported to some parts of South America, and to some of the States of North America, and they were manufactured in that way; they were cases in which *blue pill* was sold at an extraordinary low price; these substances were traced to the manufacturer; he excused himself thus: a merchant says, "I have an order to ship so much blue pill at such a price; can you produce it?" He says, "I can make you what I dare say will pass," and he produces the best thing in his power, which he says is in value equal to the price given, but certainly is not the blue pill of the Pharmacopœia. So if an order is brought to him for any substance, he can execute it just as a manufacturer at Manchester, if cotton goods are ordered at a certain price, will make the best thing he can for that price. I consider that to be an imposition upon the public, and such a state of things ought not to exist.

The inferior qualities of drugs are confined to the poorer neighbourhoods, on account of the competition in price. The samples of bi-carbonate of soda obtained in the poorer neighbourhoods were sold at 1d., whereas in the better neighbourhoods they were sold at 2d. The fact is, that even at 1d. an ounce the profit is an ample one; it might be sold at a farthing an ounce; but it is a mere question as to what the extent of reduction in the price should be. Take the case of Epsom salts; they are rarely sold at less than 1d. an ounce, but they might be sold at 1d. a pound. I referred to the article of *magnesia*, which has been alluded to as being adulterated with lime. According to the result of my experience it is never adulterated at all; magnesia does, generally, contain a little lime, but that is the result of an imperfection in the process by which it is manufactured. It is procured from magnesian limestone, but that is not an adulteration; it is an impurity resulting from the adoption of a cheap process of making it. Of late years the manufacture has been considerably improved, and it is not in such a state of impurity, as met with in commerce, as to be objectionable on that score. I do not think it would answer to adulterate magnesia. Lime is an article which, if it could be introduced in any quantity without being detected, would cheapen the product materially, and it would be worth while, on that score, to introduce it; but practically, as the result of my experience, I have examined a great number of samples, and I never met with any which I had reason to believe contained lime, as introduced for adulteration. There is no difficulty in getting good magnesia in any part of the country. With reference to what I consider, strictly speaking, to be adulterations, I consider there are two classes of adulterations, fraudulent adulterations, and what I would distinguish as conventional adulterations; by the latter term I mean to designate those cases in which the sanction of the consumer is given either directly or indirectly to the practice. Cases of fraudulent adulteration in regard to drugs are, I am of opinion, of rare occurrence, and when they occur they are generally of short continuance; those who are defrauded are put upon their guard, and that particular adulteration cannot, when once detected, be repeated. Since the existence of the Pharmaceutical Society, I believe all cases of fraudulent adulteration which have been brought to light have been brought under the cognisance of the Society, have been noticed in the Journal of that Society, and the members of the Society have generally contributed to the exposure of such cases. Dr. Thompson says that he gave evidence so far back as the year 1830, on the subject of the adulteration of drugs, and that he finds the same adulterations now going on that he did then, in consequence of no check having been provided by the Legislature after that inquiry. I think Dr. Thompson is very much deceived upon the subject. I shall have occasion to refer to one or two points which he included in his evidence, in which he shows that he is not acquainted with the facts of the case.

I will mention now the cases of fraudulent adulteration which have come within my cognizance during the last fourteen years. Some years ago, it was found that *morphia* was adulterated; one manufacturer adulterated it by the introduction of a portion of sugar, and was enabled thereby to undersell other makers; the very fact of his being able to do so led to a minute examination of what he was supplying; the fraud was detected; it was exposed, and there was an end of it; it could not be repeated, and it was not repeated. The public were put upon their guard; I mean by "the public" those who were dealers in the article; and no similar case has subsequently been brought to light. Another case occurred in which *opium* was introduced into this country which was a completely fabricated article, containing no morphia. It came from abroad, but it could not be traced; it was not known what its original source was. It was offered in the market, examined by those who were accustomed to use opium, and found to be worthless. It met with no customers. It went to France; it was noticed in the public journals, and was not sold there; in fact the fabricator had outwitted himself; he made it so completely worthless that its detection was not difficult. It had none of the soporific qualities of opium. A few years after that there were some medicines, known as the *valerianites of zinc, iron, and quinine*, which were then introduced into medical practice, and it was found that one of the makers of those articles was substituting comparatively valueless products, which were merely flavoured with the essential oil of valerian, and selling them for the true valerianates; in that case he was able to undersell his competitors. It led to an investigation of the subject; the fraud was detected, and the practice was at once suppressed. *Isinglass* was another substance which was adulterated, and those adulterations came specially under my own notice. I have here a specimen of adulterated isinglass which was examined by myself; it was adulterated with gelatine, by rolling a sheet of gelatine between two sheets of isinglass, and then cutting it up in the usual way. The public would not be able to detect the difference; there was about one-third of gelatine. The difference in price of the two articles is very great. The gelatine which was used was worth about 2s. a pound, and the isinglass adulterated with it was worth about 16s. a pound. That was a fraud upon the pocket. The qualities of good gelatine are equal to those of isinglass. The difference was principally distinguished by the microscope. This was a singular case. The practice I have reason to suppose was entirely stopped upon its being exposed. The cases referred to by Dr. Hassall are cases in which a very superior class of gelatine has been sold for isinglass. As I have already stated, gelatine may be produced which is in every respect equal to the best isinglass. It is called isinglass because the public are attached to the name. The name of gelatine has been generally associated with a very inferior description of gelatine. Of late years a very superior description has been produced, quite as good as the best isinglass; and there are some houses of very high standing who, when they are even asked for isinglass, sell this superior description of gelatine. It is sold, I believe, under the name of patent isinglass. I do not consider it is justifiable to use the name. I am not quite sure that Dr. Hassall may have been entirely right in what he states; I have been assured by the manufacturers of the kind of article referred to that isinglass is, at any rate, to some extent used in the production of gelatine. All that he would be able to say would be this, that it had been in solution. Isinglass, as it is commonly sold, is a tissue which has never been dissolved; it consists of the tissue of the swimming bladder of the fish in its ordinary organised condition. If the isinglass is dissolved in water and evaporated, and cut up, it would be essentially the same thing; but Dr. Hassall would not be able to distinguish it from gelatine. I believe no injury accrues to the public health by the sale of gelatine under the name of isinglass; the sort of gelatine referred to by Dr. Hassall, I believe, is as good as the best isinglass.

Another case which has come under my cognizance was one in which *borax* was found to be mixed with phosphate of soda, but as soon as the adulteration was detected it was put a stop to. Borax is principally used in the arts; very little in medicine; and this fraud was easily detected, because phosphate of soda is efflorescent and borax is not so. It was the crystals of one salt mixed with the crystals of another. It was at Liverpool. Another case which has been brought under our notice is that of the adulteration of *lard*. Lard is imported from America in large quantities, some in bladders and some in firkins. This lard is frequently mixed with flour. Lard is used in medicine, and in applying it to certain pharmaceutical purposes this fraud has been detected. That has not been put a stop to, because the original source of the adulteration is beyond our reach, it coming into this country in this adulterated state. But since this adulteration has been detected I apprehend it would be very little used by druggists; it would still find its way into the hands of the cook, and be sold by the butterman. I believe the English lard is not adulterated; I have never met with a case in which it was so. I have not specially examined it. I will mention another case, which was not strictly one of fraudulent adulteration; but it is one which, nevertheless, I wish to bring under notice, because it shows that druggists are constantly upon the alert. A case occurred not long ago, in which a medicine which consists of iron reduced by hydrogen was found to be not in the state in which it purported to be; one of the oxides of iron was substituted for it. I believe in that case the manufacturer was not aware himself that he was selling for pure iron, or iron reduced by hydrogen, another substance; but it was speedily detected. Competitors in business are always on the alert to find out these things and I consider the most efficient means for their detection exists at the present time in that way. When I speak of competition leading to the detection of adulteration, I speak of that legitimate competition which always exist between men in the same line of business; if two men are manufacturers of morphia, and one is enabled to undersell the other to the extent of 2d. an ounce, there is at once a motive in the man who is undersold to endeavour to ascertain whether his competitor is selling a genuine article or not. I do not consider that the adulteration of morphia could exist for twelve months without detection. With the exception of one or two cases, these classes of adulteration have ceased. I am sure that all the cases of fraudulent adulteration of drugs, which have occurred during the last fourteen years, have come under my knowledge. I except the cases I before referred to, which are connected with drug grinding. These were well defined cases, in which the adulteration could be readily ascertained. Many cases of fraudulent adulteration may have existed, and may exist now, which have never been brought to light; but all those cases which have been brought to light within the period I have mentioned, have come under my cognisance, and I have here enumerated them.

The production of drugs has improved within my experience very decidedly, and as the education and information of the sellers of drugs improves, there will be a continued improvement in that respect. Dealers in drugs are better educated, better informed, better able to make a judicious selection of the drugs which they use, and better able to detect adulterations if they should exist.

In reference to the importation of several drugs, there has been a marked improvement, and that has originated entirely with the retail druggist. Ten years ago all *Alexandrian senna* which was imported into this country from Egypt was adulterated with a certain leaf; the Alexandrian senna contained from 15 up to 20 or 30 per cent. of this leaf. Now, this was so completely an established practice in reference to that substance, that in every work on *Materia Medica*, Alexandrian senna was described as consisting of these two leaves. The subject was brought under the notice of the Pharmaceutical Society, and druggists were put upon their guard in reference to this article. They began to give the preference to those samples of Alexandrian senna which contained the smallest proportion of this admixture, and the result has been that the commerce in the article has completely changed, and Alexandrian senna now comes into the market almost entirely devoid of the other leaf, because those samples which contain much of the adulteration will not meet with a ready sale. This has entirely originated with the retail druggists, and in the better information of that class. A great deal of attention has been directed to the subject of *scammony* within the period I have adverted to. Ten years ago it was impossible to get a specimen of scammony which was not adulterated. There is no adulteration in it in this country. Scammony, opium, and senna, and those things, are never adulterated here; they are adulterated in the countries in which they are prepared. Scammony was at that time principally adulterated with chalk and with flour; some specimens were adulterated with chalk, and some with flour; the preparers excuse the practice by saying that scammony cannot be collected and preserved without an admixture of some absorbent powder which facilitates the drying of the product; it is a juice which exudes from a root when it is cut; if the juice were collected and allowed to dry spontaneously in the air without any admixture, it is stated that it would be liable to spoil, and its preservation is promoted by the admixture of some absorbent powder; this may or may not, to a certain extent, be true; the practice, however, was to mix some substance with it, in some cases flour, and in some chalk; that practice has continued to the present day with reference to the greater part of the scammony which is imported; but the attention of druggists has been directed to the subject, and druggists have been seeking after those specimens which are freest from this adulteration, in rejecting those specimens which are found to contain chalk and flour, and now scammony can be met with occasionally entirely free from such adulteration, but it is at a very high price, a price at which it would be impossible to sell it in many neighbourhoods; but those druggists who are more anxious for the qualities of their goods than the price of them, do get it, and I have a specimen here of perfectly pure scammony. The same may be said as to *opium*; opium is an article which never comes into this country free from any admixture; it is not one substance, but a very heterogeneous substance; a mixture of the exudation from the poppy capsule when wounded, with certain impurities, which are scraped off the surface of the capsule in its collection, and other substances which are added during the process; but there is a very great amount of difference in the degree of admixture which is made in opium. The best opium comes from Turkey, and I may here refer to a mistake of Dr. Thompson, who represented Indian opium as pure opium. Indian opium is not an article consumed in this country, and simply for this reason, that it has no sale here on account of its very inferior quality; Indian opium has not one-half the amount of active matter in it which an average sample of Turkey opium contains. The mode of preparing it is defective in some way or other; certain it is that it is of very inferior quality. The Government appear to be quite aware of its inferiority, because they have placed a restriction on the introduction of Turkey opium, which would be used in India if it were permitted to be imported. The opium of India must be itself inferior, because it never passes out of the hands of the Government. Opium is never adulterated in this country; I never heard an instance of it, and I believe it to be impossible.

By the "conventional" adulterations I mean those in which the sanction of the dealer or the consumer of the article is given either directly or indirectly. Thus, for instance, if you take the case of opium, you say it is adulterated; but we say that opium is that substance which the public understands by that term, and which the medical man understands. It is not one substance; it is not a pure thing; you may call all those matters which are introduced adulteration, but it is an adulteration which is sanctioned by all the parties concerned in its preparation and use. I consider the colouring of sugar-plums a conventional adulteration; and also the colouring of anchovies with bole Armenian. The use of copper to give a green colour to pickles may come under the designation of a conventional adulteration, but not of a harmless character. Conventional adulterations I conceive to be those which are caused by the public demanding a certain substance which a dealer has to supply. The public may be deficient in information or in judgment; thus, for instance, the public are accustomed to consider that anchovies are not good unless they are red, and that pickles are better in quality when they are of a green colour than when they are devoid of that colour. There is a prejudice in the mind of the public, and the producer, in order to meet this prejudice, puts in in one case a little bole Armenian, a harmless powder, to give the required red colour, and in the other case he resorts to the use of copper, from ignorance, but still to meet a demand on the part of the public; it is a conventionality between him and the public; the public will have a green pickle; neither the one nor the other knows, while the practice continues, what evil has been the result of it; therefore there may be a conventional adulteration which is productive of great mischief. I suspect it was supposed that the small quantity of copper that was introduced would do no harm, just as in France it is well known that sulphate of copper is generally introduced into the bread. The French government has done much to put a stop to the practice; I believe now it is a very minute quantity which is introduced, which gives a whiteness to the appearance of the bread, but it is as common a practice as putting alum into bread here. The government found they were wholly powerless to suppress it. It has been suppressed according to the letter of the law, but not practically. Among other cases of conventional adulteration occurring in substances used in medicine, I may mention *calamine;* it was referred to by Dr. Thompson, as having existed when he made his report in 1830, and being found by him to exist at the present time. Calamine is a native carbonate of zinc; it is a mineral which is found associated with sulphate of baryta. It is certainly a fact, that for many years past, true calamine has not existed in the market; it was found many years ago, when the subject was investigated by Dr. Thompson, and it has since been found by others, that sulphate of baryta coloured with a little oxide of iron was substituted for true calamine. The subject has been very much investigated by the Pharmaceutical Society, and members of the society have taken great pains in endeavouring to do away with the evil which was found to exist in reference to this subject. I have here some specimens which will serve to illustrate the manner in which the adulteration, or rather the substitution, seems to have been brought about. In the neighbourhood of Matlock most of the calamine is found. I have here a specimen of the mineral as it is dug out of the earth; this is true calamine or carbonate of zinc; it is found inter-stratified with sulphate of baryta, both being dug out at the same time. There is some difficulty in separating the one from the other; calamine is a very pure substance, it varies very considerably in its general appearance and colour; that substance reduced to powder would constitute the true calamine, and I have here a specimen of true calamine which has been prepared from it. The colour is a dull dirty looking colour; some very choice specimens, if selected, would have a much brighter colour, and the public become accustomed to select calamine and to judge of its quality by the brightness of its colour. Calamine is used only as an external application in ointments. It is a substance which is of little or no medicinal efficacy; it has been used for many years in the preparation of what is called Turner's cerate, and that is its principal application; in this application of it, it is not easy to discover how much of the effect is due to the medicine which is applied, namely, to the calamine; and hence, therefore, if something else were substituted for it, that other substance, though it would be perfectly inert, might be used for half-a-century without any difference in the effects being observable; and as at that time (and I am now speaking of a period of fifty or a hundred years ago) druggists were very ignorant upon these subjects, and judged of their calamine principally by its appearance, as I have admitted many, if not most, drugs are still judged of by a large number of druggists; if a powder were produced which had the external character of calamine, and put into the hands of a druggist, he would use it; and if nothing in its use led to a suspicion that it was not the right thing, he might go on using it for half-a-century without its being discovered. Those who collect the calamine have another application for it. Besides its use in medicine, it is used for making brass. Now, nothing could be substituted for calamine in making brass, without being found out. If sulphate of baryta were put into copper instead of calamine it would not produce brass; but if sulphate of baryta were put into Turner's cerate in the place of calamine, it would not be detected. Sulphate of baryta is dug together with calamine; they both come out together; and practically it is the fact that years and years ago it became the practice of those who got the calamine to separate the sulphate of baryta, to sell the true calamine for making brass, to send up the sulphate of baryta coloured with a little oxide of iron, and to sell it to druggists for true calamine; and the calamine which has been in commerce for years has consisted of such a mixture. *Armenian bole* has been frequently referred to for colouring anchovies; there is no such thing as true Armenian bole in this country, and has not been for a century. It is an entirely fabricated article. It was originally red earth which came from Armenia, as its name indicates; what is now sold as such is a little chalk and pipeclay, mixed with a little oxide of iron.

The next substance I wish to refer to as a conventional adulteration among drugs is *milk of sulphur*. I wish in one respect to correct the evidence which I gave on the last occasion. Milk of sulphur has frequently been referred to as evidence of the great adulteration of drugs. Much which is met with in commerce is found to contain a large quantity of sulphate of lime. I wish to give the origin of this. Milk of sulphur was ordered by the College of Surgeons in London, in their Pharmacopœia of 1821, to be made by boiling sulphur and lime together with water, and adding to the solution spirit of vitriol. Spirit of vitriol is dilute sulphuric acid; that was ordered under the title of lac sulphuris, and the product obtained by that process is a mixture of sulphur and sulphate of lime; it constitutes the milk of sulphur to which I am now referring; it would contain between 40 and 50 per cent. of its weight of sulphate of lime. I have carefully looked through the Pharmacopœias and other authorities, and that is the only authoritative process I can find which has been given for the preparation of milk of sulphur. In a subsequent Pharmacopœia the college altered the name to sulphur præcipitatum, and they altered the process, by which a product was obtained which contained no sulphate of lime. The public having for a long series of years used the milk of sulphur prepared by the first of those processes, have become so accustomed to it that many of them will not use any other. There is this difference between the two, that the milk of sulphur which contains sulphate of lime mixes readily with water; it forms a sort of lactescent mixture, which the public are accustomed to, and they require it, and the dealer supplies them with it; it is a conventionality, therefore, between the dealer in drugs and the public. Another case of conventional adulteration in articles used in medicine is the case of *oxide of zinc*. I have myself taken a great deal of pains to try to disabuse the public mind upon the subject, and to prevent one substance being used in place of another. The oxide of zinc, as it is ordered by the College of Physicians at the present day, is a pure product; but as it was ordered by the College of Physicians in 1824, it was not a pure product. That which they ordered in 1824 was a perfectly white smooth powder. The public became accustomed to the use of that as oxide of zinc. In 1836 the College of Physicians changed the process, and they substituted a process which gave the pure product; the other is not pure; it contains 30 or 40 per cent. of foreign matter. This pure product, however, differs from that which was previously in use, inasmuch as it is not white. Now the public, in the first instance, refused to receive the second product as oxide of zinc; they had been accustomed to a white powder, and they continued to use it, and it is a long time before we can disabuse the public mind upon such a subject. I speak principally of the chemist and druggist, who is accustomed to use this in ointments; and it is among the class of the less-informed chemists that the practice continues to prevail of using the white article; they have been accustomed to judge of oxide of zinc by its external character, and when oxide of zinc is sent to them which is not white, they return it as not being that which it ought to be: there are some medical men who still continue to use the white oxide of zinc, and reject the purer article prepared by the more recent process of the Pharmacopœia.

There is one other case, and only one, which I wish to refer to, and that is with a view of correcting what I conceive might otherwise be a misapprehension on the part of the Committee. Reference has been made by the gentlemen who have given evidence to adulterations in *gin*; it has been represented as being adulterated, and articles have been specified as used for the purpose, namely, oil of vitriol, oil of almonds, salt of tartar, and alum. I merely wish that there should be no misapprehension on the subject. Those articles are used by those who deal in gin; they are used much in the same way as isinglass is used by those who deal in beer. It has become the practice among those who retail gin to make the price to the public very nearly that of the wholesale dealers to him; that is to say, the public are supplied with gin retail nominally at the same, or almost the same, price that the distiller supplies it to the publican. The publican makes his profit by reducing the strength of the spirit after it comes into his possession; that is to say, he receives the gin from the distiller of a greater strength than he supplies it to the public, or than the public requires to have it. He mixes a certain amount of water with the gin. I have, during a recent investigation I had to make for the Board of Excise, had frequent communications with the distillers, and I have been in communication with some distillers upon this subject since this Committee has been sitting. In the manufacture of gin, certain substances, as for instance, juniper berries and coriander seeds, are always used. Gin is, in point of fact, a pure flavoured spirit, which is unexceptionable in its quality. This gin is supplied to the publican at a greater strength than that at which it is supplied by him to the public. When it comes into the publican's hands it is mixed with a certain amount of water, and it is in that way that he makes his profit. The public is not damaged by this, because it comes to just the same thing as if it were diluted by the distiller before it came to the publican. If the public were supplied with gin in its stronger state, they must pay a higher price. In the state in which it is now supplied to them, it is just suitable to their tastes. I do not consider that the gin is deteriorated. Water is added, and sometimes a little sugar. The effect of diluting it with water is to destroy to a certain extent its transparency. Gin contains certain volatile oils; it is the purest spirit which can be produced in this country, distilled from juniper berries, coriander seeds, and some other flavouring materials being put into the still. When the spirit is diluted with water, some of the essential oil is separated, and it becomes a little clouded; and the publican has to fine it to restore its transparency. He does that by introducing into it salt of tartar and alum. Those are things which, when mixed together, produce a decomposition. Alumina is precipitated, and this alumina, mixed with the spirit, together with sulphate of potash produced at the same time, which is not soluble in the spirit, falls down through the spirit, and carries with it the oil which had been separated, caused by the dilution with water. This is one of the processes of fining. The gin is in no way deteriorated by it, any more than wine is by putting the white of an egg into it to fine it, or beer by putting isinglass; it is known as a fining material, and it is used for the purpose. There are many practices of that description. I believe it is in the same way the publican frequently dilutes his *beer*. He gets his beer from the brewer of a greater strength than he can afford to sell it at the price at which he commonly sells it. There is little or no disparity between the wholesale price of beer and the price at which the publican sells it to the public, but the profit of the publican is obtained by diluting the beer. His motive, perhaps, for conducting his business in that way is, that the public may not know what his profits are, and he prevents that, or he imagines that he prevents it, by carrying on his trade in that way. Practically, if he did not dilute it in that way, the brewer would have to do so; he must supply the publican with beer that he could afford to sell at the price which the publican expects to get for it. It is a profitable thing for the publican to adulterate, in one sense, certainly; he sells more in consequence of selling cheaper. If he wants to transfer his license, or part with his business, there is inquiry as to the amount of consumption in his house, and if he sells more, it is an advantage to him. The only objection to selling the pure article is this; the public would have a better means of knowing what the dealer's profit was. The public can go to the brewer and get a barrel of beer, and the publican does the same thing. If the public bought from the brewer the same thing that the publican sold, the public knowing they pay so much for a barrel of beer, on sending to the publican for it, and paying so much more, would know what the publican's profit was; but the publican deprives the public of the means of knowing that by altering the quality of the beer. He is partly the brewer, in point of fact. I am aware that certain things are added in order artificially to reproduce the strength which is lost by the dilution; and inasmuch as that is done, the public are damaged. I do not think cocculus indicus is very much used for that purpose; because there is not much cocculus indicus used in the country at all; it has been, and is still occasionally, used to a certain extent. I am not aware that there is a larger quantity of cocculus indicus imported now than there was some years ago; it may be so. The price has considerably advanced.

The adulteration I have described as common in gin is not prejudicial to the public health, in my opinion. It is rather beneficial to the public health that they should not have too strong a spirit supplied to them. I do not admit it to be an adulteration; the gin is produced of that strength which best suits the public taste; the public have been accustomed for a series of years to drinking spirits of a certain strength; they have got into that habit, and they require spirit of a certain strength; I conceive that what is sold by the publican is just of the strength which best suits the public taste; and if the publican did not bring it to that condition the distiller would. In almost every trade there is assumed, or actually existing, a certain amount of art and mystery; it is so in the trade of a publican; the publican conceives that he knows a great deal connected with his business beyond what the public does; he has certain secret methods of improving the quality of his goods upon which he prides himself; some of those are of little or no value, some of them may be hurtful, some of them may have for their object to enable him to get a larger profit. The class of persons known as publicans' adulterators, are a class of quacks, who go round pretending to instruct the publicans, giving a certain amount of information mixed up with a great deal of nonsense, and inducing them to believe that they become, by possessing this knowledge, enabled to carry out their business to better advantage. Gin is always produced by the rectifier; it is not produced by the great distillers, that is, not by the man who produces the spirit in the first instance; the spirit goes from the distiller to the rectifier; the rectifier purifies the spirit, and flavours it with the substances I have mentioned, for the publican, and he sells pure spirit for the use of chemists and druggists, and other persons. I think that gin is very little adulterated injuriously; beer is much more largely adulterated, and substances prejudicial to health are constantly introduced into beer. I am speaking from my own observation, and from information derived from very extensive distillers. I have heard the evidence which has been given in this room; one gentleman said, he had not found a single sample of pure beer in the whole town. I want to know what is the standard of purity; almost all the statements of that description which have been made here are of a vague nature, and those gentlemen, if they were cross-questioned by persons practically acquainted with the subject, would have their evidence put into a very different form. Those gentlemen say they found water present in a very large amount. Gin consists of more than half water essentially. I did not hear it stated.

that from extensive observation those gentlemen had found that there were substances constantly present which were prejudicial; if they include among the impurities water, 'added to gin, I admit it; if they consider that the use of this substance for fining gin is an additional impurity I admit it is used, and so of the oil of vitriol, which is added for a specific purpose; but you will have a very erroneous notion of the evil resulting from it, if you only take those general statements. If a man put a label upon two articles in his window, "porter mixed with water" and "porter pure," persons generally would prefer the porter which was pure, and not that mixed with water; and yet both would contain water of course. Water is one of the constituents of the article; but I do not admit that it is a deception. The consumers generally do not know the fact, and prefer the porter and water, and not the porter pure; nor is it necessary that they should know it. I admit that after the publican has adulterated the gin, or weakened it with water, he then has to reproduce strength by the admixture of the materials which have been mentioned; but the consumer is not injured by that process. If anything were put in which was injurious, he would be injured; but I do not consider that there is a practical deception in the case, because the article which is sold at last is sold at a fair price. There is no exorbitant price demanded for it; the public, therefore, are not in any way injured. None of those substances which are added to gin are injurious to the public health; there may be other substances occasionally added, but I wish to remove a prejudice as to those substances. It is purely a question between buyer and seller as regards the quality of the goods. If you buy wine it professes to be the fermented juice of the grape, but if a man in preparing wine finds that he can improve it by putting in a certain seed which improves the flavour, he produces a better article, and if it is not injurious to health, no one suffers from such a practice. If he puts in water to reduce the strength, and another article artificially to reproduce the strength he has taken away, I still maintain that the public is not injured, provided the article is not prejudicial to health. You must understand what this introduction of artificial strength is; oil of almonds and oil of vitriol are used under the denomination of beading. It certainly sounds somewhat alarming to be told that oil of vitriol is always or generally added to gin, but yet, as a matter of fact, it is so: I have here some of the mixture which is practically added, in the state in which it is used; one drachm of oil of vitriol and an equal quantity of oil of sweet almonds are triturated together in a mortar, and subsequently mixed with some stronger spirit; this is called beading. It is added to 100 gallons of gin, and when so added there will be one drop of oil of vitriol to each gallon of gin. I conceive that the quantity is so small that it would be entirely inappreciable, and would have no effect upon the health of the party drinking it: the object of it is to produce a particular character in the beading of the spirit. The spirit when shaken has a briskness or beading, which it would not have to the same extent without this. It is mixed up with the gin with the original object of the publican, namely, to keep the public in ignorance of the profits of his trade; he gets the gin stronger than in the state in which it is sold, and he obtains his profit by adding a certain amount of water to it; but he probably may reason in this way, that if the public were to send to the distiller for the same gin which is sent to him, they would pay about the same price at both places, and on drinking it they would not readily detect the difference, but possibly, by observing a difference in the beading, they might see that the one had a greater briskness than the other, and he produces that increased briskness in this way. I conceive he does in that respect precisely what traders commonly and habitually do, namely, he gives the best external character he can to his article, and makes it pass for as good an article as possible. The object of adding this beading to the spirit is to produce the same appearance in the spirit mixed with water which was possessed by the pure spirit before the water was put into it. The public are in that respect deceived, but not injured, because they get it at the price which they would pay for it under any circumstances. They know nothing as to the manufacture of gin, but if they get what they usually receive as gin, they are well content. The term "gin" is in itself a mere artificial term, and it may apply equally to the mixture I have described as to the spirit sent out from the distillers. It is more generally understood to represent the article which I have described.

I have heard of cayenne pepper being used to give an appearance of strength by the effect upon the palate, but I believe t the use of such substances is extremely rare, and gin really is a substance which does not admit of being tampered with, and it is not tampered with; but the public get it in the state of a perfectly wholesome beverage. As a general rule such substances are not used. When they are used it is a fraud. I have met with sulphate of iron in porter, but I do not think in the quantity in which it is used it is decidedly prejudicial to health; I think it is an objectionable practice to introduce it. I never heard of a case in which a person was poisoned by it. The case mentioned by Dr. Normandy, in which very serious and even fatal consequences resulted from the use of it, must be a very extreme case. I am not able to state the proportion in which sulphate of iron is usually introduced into porter, though I have frequently known it to be used. It gives it a head, and also an appearance of strength. The accounts which have been given at different times of persons being poisoned, or made very ill, by spirit being adulterated with cocculus indicus or excessive quantities of vitriol, must be regarded as merely exceptional, and as resulting from a want of skill or care on the part of the publican. I have said that other witnesses have given vague evidence; they speak, for instance, of gin being commonly adulterated, and its being an exception to the rule when it is not so; they do not state what they mean by adulteration; if they mean admixture, I admit it is not only common but universal. I do not consider beading to be an adulteration; there is nothing prejudicial in it. The meaning of the word adulteration is not the admixture of things which are foreign to the article sold, but simply the introduction of articles which are prejudicial to health, or which will in some way deteriorate the quality of the article. The admixture of a cheaper article with a dearer article does not necessarily deteriorate the value of the dearer article; it may make it better adapted to the purpose for which it is intended. Suppose a distiller never sold anything but absolute alcohol; absolute alcohol could not be drunk by the public without their being greatly injured. The publican then would have to dilute it with water, and with such a quantity as should render it suitable for a beverage (and the distiller, practically, sells his spirits in a greater strength than the publican requires to have them), and to dilute them to a proper degree. If you send to Hodges and obtain a certain quantity of gin from his house, and then get a quantity of Hodges' gin from a public-house, with respect to taste and flavour, I believe one would be as good as the other. If you were an adept, you might be able to distinguish the difference in the strength; you would find that one would bear a greater amount of dilution than the other, with water; but, taking them in an undiluted state, you would have some difficulty in distinguishing them by the taste.

FURTHER EVIDENCE OF ALPHONSE NORMANDY, Esq., M.D.

I MADE a statement upon my former examination with respect to carbonate of soda. I stated that I had frequently found bi-carbonate of soda adulterated with sulphate of soda. I have heard the statement made by Mr. Redwood in reference to my having supplied him with a sample of bi-carbonate of soda which contained sulphate of soda. If you will permit me I will relate in a few words what took place. In consequence of Mr. Redwood, a gentleman for whom I profess the greatest esteem and respect, having thrown some doubt as to bi-carbonate of soda being seldom impure, I called on a chemist and druggist in my neighbourhood, and directed him to give me an ounce of carbonate of soda, which he did. When he had done so, I requested him to put his seal on the paper, and his label, so that it could not be tampered with. I then requested him to give me another half-ounce of the same bulk, and when he had done so, I told him I intended to analyse it. He said, "You will find, I think, that it is pure, because I pay the highest price for it." I said, "Are you aware that bi-carbonate of soda is largely adulterated?" He said, "Yes; I have frequently found myself that bi-carbonate of soda, instead of being entirely soluble in water, as it should be if pure, has left, on the contrary, a pretty large quantity of insoluble matter, which I take to be sulphate of lime or carbonate of lime. Besides that, bi-carbonate of soda is also offered at a much lower price than I pay; in fact, the price varies from 16s. per cwt. to 56s. per cwt." He showed me a printed list of prices from one of the large manufacturers in London, in which I saw those prices printed, and he said, "I judge from that, of course, that bi-carbonate of soda must often be sold in an impure state, from the fact of this great difference in the price." I asked him if he could tell me where I was likely to get an impure bi-carbonate of soda. He told me, 'If you go into one of the back streets of Somers-town I have no doubt you will find it there." I did so; I went to two shops; I directed at each shop the parcels to be treated in the same way; that is to say, one of them to be perfectly sealed and the other open, so that I might analyse it. I found one to be pure, containing only between one and two per cent. of sulphate of soda, which I call pure for all practical purposes; but, on examining the second parcel I found it upwards of 11½ per cent. of sulphate of soda. Being on friendly terms with Mr. Redwood, I called upon him, and asked him, "What would you consider an unwarrantable impurity in carbonate of soda; would you consider five per cent. an unwarrantable impurity?" He said, "Decidedly." And I answered, "Here is a sample which contains upwards of 11½ per cent.; will you please to break the seal yourself, so that you shall see that it is a genuinely bought article; take half of it, analyse it, and re-seal the remainder, in order that my evidence should not be questioned." He did so, as you have heard, and he found, like myself, 12 per cent. of impurity. Now with respect to his having taken a great deal of trouble; I know it is a great trouble to procure samples; it appears that he has procured some forty or fifty samples: and he says all those were perfectly pure. I cannot account for it in any other way, except that I believe there is now a great deal of stir made, and if any person suspected to require a drug for analysis comes into a shop, he will not get an impure drug; I say that because I called at the request of one of the Members of the House upon one of the large sellers of chocolate. I have been twice, and I cannot get it; they tell me they do not keep it, or they have no more of that stuff, and so on.

WEDNESDAY, August 1st, 1855.

EVIDENCE OF Mr. THOMAS HERRING.

I am a wholesale chemist and druggist, and have been in business above forty years. During that time, and particularly for the last twenty years, I have had great experience in my own way of trade, and from what I have seen besides. Adulteration in the article of drugs exists to a very great extent; I will show you what is going on at the present day. Last week, or the week before, we had a sale of a most important article, *scammony*. It took place at Garraway's Coffee-house. Brokers are employed by merchants to sell these articles. Scammony comes principally from Aleppo, Smyrna, and those parts. It is one of the most important drugs we have. As an article of commerce, the scammony which we consider ought to be used will cost us 40s. a pound; but here is a piece which will show the Committee what is sold very often for that article. The true article is called virgin scammony, and I have been compelled to give 40s. a pound for it. The law allows anything to be imported, and that which I have before me was imported in the last month, and was sold at a public sale for 3s. a pound. It contains not one atom of scammony; not a trace of it. It is all gum and a mixture of various kinds; but still it is imported as scammony, paying no duty, and in it comes. There is a large demand for that spurious article, ten or twenty times as much as for the other. If it was not used parties would not keep it; but it is used no doubt to a very great extent. To show the Committee how difficult it is to get a pure article, I may state that a great quantity comes with one-third and one-fourth adulteration; and I have lately examined four parcels of scammony, one of which was imported by ourselves, and the others by different merchants, and none of them contained any but a small portion of scammony. We ascertained that in one parcel, which was an exceedingly good one, out of 100 parts of the article there were 70 parts of scammony, 24 of insoluble matter, and six of water; that we call an excellent article. One had 58 parts of scammony, 36 of insoluble matter, and six of water; and we descended at last to one containing 60 per cent. of scammony, insoluble matter 36, and water four. We have some which is imported, not in this shape, which will contain from 80 to 90 per cent. of chalk. We analyse it, and get out the chalk and dirt, and see what scammony there is. This is one of the most important drugs we have, and still more so when you know that it enters into the compound extract which every medical man in ordinary practice is prescribing every day. When he is prescribing pills which are made from that compound article, he is doing more mischief than good, because instead of acting as an aperient it is acting quite as an astringent; a man is taking a quantity of chalk, and in many instances the bowels have been bound up, and it has been found to be occasioned by the medicine which has been taken.

It was stated in some of the evidence which has been given before the Committee, that *opium* was imported nineteen times out of twenty adulterated. It always comes adulterated; it cannot come otherwise; it is a compound of the juice of the poppy mixed with other leaves to make it adhere together, and very often a great deal of dirt. Sometimes it comes so much adulterated that no man of any experience will say it ought to be used at all, and I have now a piece in my hand which was sold last week at about 4s. a pound, when I should be glad to give 20s. for common good opium. The broker who gave it me had it analysed, and there is not a grain of morphia to be detected in it. Opium in its pure state could not be formed into a cake; it requires to be mixed with some other articles. The same remark applies to scammony; that is collected from the juice of a plant, and they put plates underneath the plant, strewed with a little lime or clay, so that when the plate is full you can brush it off into the little thing they call a drum; that is the cause of our getting dirt in it. We must always expect a small quantity of extraneous matter, but it is only where the extraneous matter becomes excessive in quantity that we deem the article adulterated. I have for the last twenty years studied this question very minutely, and done everything I could with respect to it, upon the principle that I believed no medicine ought to be used but what is pure. A man goes to Newgate Market and pronounces certain meat to be bad, and it is at once condemned. That is very important, no doubt, but I think that medicine is still more important to be pure, and the public, wherever they may be, should have what the medical man prescribes. If a patient had a prescription given to him containing laudanum, if it were compounded of that spurious substance, it could do him no good, but might do him harm. In some cases it might even lead to fatal consequences. I think the course pursued by the American authorities is a very proper one with reference to frauds of this kind; they perhaps carried it too far, and were forced to retract what they did; they would not at one time admit any bark to go into the country, except yellow bark, for making quinine; consequently they lost the whole of the trade in quinine, because quinine is not always made of yellow bark, but of other kinds of bark. At the same time, they did not admit any drugs without inspection, and I think that was a beneficial regulation. There has been a case in America in which a large quantity of blue pill was sent in, which was not suspected to be good. It was analysed, and found to be an improper composition, and it was returned immediately. They have officers attached to a branch of the Government who have power to say, respecting an impure drug, "That it is not fit for use," and to send it back. Opium comes from Aleppo, Smyrna, and that country; very little comes from the East Indies to this country. They will not allow it to come. It is a fine opium, but we get only samples of it. We have opium sometimes from Constantinople by chance, which is also a fine opium that the doctors are very fond of. We get the East India Company's opium only in small quantities now and then; I have only seen two or three packages of it in the last forty years. Opium is only imported by one or two merchants in London, who are called Turkey merchants. They employ a broker. We go to our broker, Mr. Brooks, when we want opium; and as a great portion of the opium passes through his hands, he selects the best and finest he can. When we buy opium, we go the docks to look at it in bond; it pays 1s. a pound duty. We may say, "We do not like that chest at all," and reject it. There is a great deal of what is called ball opium. We are allowed to make experiments, to ascertain the quality of the drugs in the docks, whenever we buy large quantities. In the case of bark, for instance, they will allow us to draw a sample, to analyse and examine before we buy. We have no other check, in fact, than that of individual vigilance. They would not do it for people who wanted merely a chest or a small quantity; but if it is a large purchase, it is their duty and their interest to forward our views.

I have been turning over in mind how we could stop the importation of bad drugs, and I am convinced the only way would be for an efficient man to be appointed for the purpose; he ought to be a chemist as well as a druggist; what I should call a pharmaceutical chemist. He ought to be paid so liberally that he would not have to employ himself in anything else. And I think he ought to have power to go to the shop of any chemist and druggist, and say, "Show me your scammony;" and he ought also to be able to go to medical men, for they are the persons who get the most inferior drugs. I do not think many retail chemists can be imposed upon by the merchants; the chemists and druggists of the present day, ever since 1841, are an extremely improved body, in point of intelligence and education. I dare not send an article which has been sophisticated to any chemist of high standing; it would be an insult upon his judgment. Therefore they must know when they sell inferior drugs perfectly well. When once they get into the hands of the trade, there are some persons who will sell inferior articles. According to my idea, the best way to stop it would be to have a man appointed of science and talent, with a liberal salary, who should have power to walk into any place and inspect drugs; and if they are so bad as ought not to be compounded, the name of the dealer ought to be handed up to the Government. The very existence of such officers to whom such things might be referred, would have a powerful influence upon the trade; a man would say to himself, "The Government are going to take such active measures, I will not have any of these things for fear of my character;" that would be the means to correct it. I believe it would have an instant effect. I believe, also, that the mischief is so serious and extensive as to require such an interference as this. I believe the practice to be very pernicious. Those articles ought never to be compounded at all, because they do mischief.

I have heard some of the evidence which has been given here to the effect that there is a positive demand for inferior articles, and that it would be dangerous and even injurious to people to produce the pure article. I do not think there is any difficulty in getting a good article, but there is no doubt that the impure article has a greater sale in the market than the pure, for one very good reason; because it affords the person selling it a larger profit. That is not any advantage to the consumer; it is an injury to him. I am not aware of any preference of this kind for impure drugs. I have been a member of the council of the Pharmaceutical Society since 1841, and I can state that our whole object is, when we get hold of any bad drugs, to expose them directly. It is the opinion of a gentleman connected with that society, who has given evidence, that there is very little impurity in those drugs, and what there is is not at all injurious. I cannot agree with that. There are some chemists and druggists who are not so scrupulous as they ought to be. There are some who will buy common drugs, but as a body of men I am not aware of any who stand higher. There is scarcely a great city in the kingdom with which I have not connexion, and I must say that no men are setting their faces more against everything of the kind than they are; whether you go to Brighton, or to Edinburgh, or Liverpool, it is the case. There is no doubt there are a great many bad things sold. There always will be men not of that high character that they should be; they get a larger profit by selling a common article, and so they do it. I think myself that to prevent such articles being sold would be beneficial; and if it were held out that the Government would appoint a person who had power to examine the doings in any place, that would be effectual to check it. I do not think that the respectable portion of the profession would object to that; I think they would be delighted with it. With respect to bi-carbonate of soda, it used, when it was worth about £8 the cwt., to be hardly ever pure. Now it is only worth 15s. a cwt., and there is no inducement, therefore, to adulterate the article; it is not worth adulterating. The cause of the difference in the price is the whiteness and pureness of the article, and its solubility, which renders it a good article; the price will depend upon the style in which the thing is put up. If you go to the West end, or to the respectable parts of the City, you would get it put up in a clean and respectable way. If you go into any of the poor and low neighbourhoods, it will be weighed in a dirty scale, and put up in a discoloured piece of paper, and when you get home you will be inclined to throw it into the dust-hole.

It has been said that chemists and druggists very often give advice: this is not the case; they set their face against it. If a man came into a druggist's shop, who had cut his finger, the druggist would put a piece of strapping upon it; but if a man came for advice in a case of fever or otherwise, he would not receive it from a druggist, because they are not equal to giving it. There are instances of some of our retail druggists being apothecaries; for instance, Mr. Savory; he was originally brought up as an apothecary, consequently he would be qualified to prescribe; but if you went to Mr. John Bell, he would not give advice, because it would be going out of his line.

With regard to the supply of drugs, institutions and public bodies ought never to contract for drugs at a certain price; they ought to give what is fair for the article, and have what they order, which is not a very common case. I have never supplied drugs to Poor-law Boards, but I have seen a great deal of it, and there the powdered article will be 100 per cent. cheaper than the staple article. Take a piece of rhubarb; it shall be 8s. a pound, and the powder shall be 4s. If you were to go into a grocer's and ask for a pound of pepper, and, being served with whole pepper, were to say, "I made a mistake, I want the powdered pepper," and were to buy the powdered pepper at half the price of the whole pepper, your wives, I fancy, would be very apt to ask you, "Where did you get it?" I leave you to infer what the fact must be. I have no doubt that Poor-law unions are imposed on to a very great extent in the drugs which are supplied to them. I consider that a system of inspection would be a great benefit to all classes of the community, and among others, to the poor. Why should Apothecaries' Hall get such an enormous price for their articles? Simply because they really supply what they are asked for, and they say, "We must be paid for doing so." There is no economy in using bad drugs, but quite the reverse. It has been stated that there is a grower at Banbury who sells to wholesale chemists as much as twenty tons of *English rhubarb.* I have no doubt he grows half as much; that is sold to druggists, and is worth about 40s. a cwt. or 5d. a lb., and it has a very pretty colour; it produces an irritation in the bowels, but it does no good. It has also been stated that *calomel* is adulterated with 50 or 60 per cent of chalk. Now that could not be: when people adulterate articles they put in something which has the same appearance; that is not the case with chalk and calomel.

There are one or two observations upon another subject which I should be glad to make. We are ordered to make our compounds according to the Pharmacopœa: but we have three Pharmacopœas; one for Dublin, one for Scotland, and one for London. If you have a prescription made up in Edinburgh which contained a solution of opium, it would be made up in the Edinburgh form; but if you brought that prescription into a London house, and the young man made it up, as he would, according to the London form, you would be taking double the quantity of opium you ought to take. And prussic acid precisely in the same way. If a man is taking prussic acid at Edinburgh, and then comes to London to get his prescription made up, he will be taking double the dose. We are now working with the College of Physicians, and with all the experienced chemists and druggists in London, to form a National Pharmacopœa, and are going through it minutely; it will involve a great deal of labour. In the case of prussic acid, Edinburgh prussic acid is twice the strength of London prussic acid. If you were ordered to take five drops and increase it to ten, when you went to Edinburgh you would be taking ten drops and twenty. Many fatal accidents have occurred in consequence. I will take the liquor morphiæ of London: the article is double the strength of that at Dublin and Edinburgh; therefore, if you had it made up in London, you would be taking a strong dose; and if you went to Dublin, you would be taking only half a dose. Under the Bill which has been prepared, chemists and druggists will be compelled to go under examination before they can enter into business. I have seen a young man take foxglove and make a tincture of it, thinking it was henbane; but all those young men will in future have to go under a course of pharmaceutical botany. I am stating this to show the anxiety of chemists and druggists to improve their own body.

We have lately had an order from the Government for a large quantity of *cinnamon powder;* one of the medical men of the

Board asked the prices of various things, and he thought them very dear. I said, "Gentlemen, what are the staple articles? if you get it cheaper than our price you must be using cassia instead of cinnamon;" and that is continually done. Cassia is commonly used, and it is commonly miscalled cinnamon. I am not aware that barley or rice flour has ever been substituted for true powder of cinnamon; that would be detected. Cinnamon powder forms a strong ingredient in the aromatics ordered in diarrhœa, and of course the prescription of a medical man may be defeated by the impure state of the drug. If he used cassia instead of cinnamon it would have no effect at all; whereas cinnamon is an astringent, and would have an effect. That is a very important adulteration, but any druggist could detect it. *Jalap powder* is frequently adulterated with raspings of guiacum; even last week the merchants have been importing an article called jalap tops, which is merely the cuttings of the tree, not the root, and which has been sold at 2d. per lb.; people do not buy it to look at; it has no medicinal property at all. I do not think that *powder of ginger* is ever adulterated with barley or rice flour: if they did adulterate it they would use inferior ginger; you may buy ginger from 4d. to 2s. per lb.

I know the composition of most of the pills and patent medicines which are sold in the metropolis; but I never paid any particular attention to them. I cannot say whether they are made up of adulterated drugs. We cannot tell what some of them are made of; whatever they may be, if they were to put powder of post into pills, and advertise them, they would sell, no doubt; it all depends upon the advertisement. "No longer pipe, no longer dance." I have known a man pay £4000 a year for advertising a composition not worth a penny. It sold only because it had an attractive advertisement attached to it: he had only to leave off the advertisements, and none would be sold. Cases are brought before the public in which a cough or cold has been said to have been cured at once, which a man has had for forty years.

The Committee has been told by one witness, that chemists and druggists do not analyse their own goods, but judge of them very much by the external appearance, as a butcher does his meat: I should say it would depend upon the house he had it from. I would not boast of my own, but if I were to send an article out, perhaps it would not be examined at all. I do not consider an examination by the eye sufficient; but I think druggists are so generally up to the mark now, that it would take a very clever fellow to cheat them; knowledge has destroyed all power to cheat them in that way.

EVIDENCE OF PETER L. SIMMONDS, Esq.

I AM the author of a work upon the commercial products of the United Kingdom, and in the course of preparing that work I have had under my consideration the question of adulteration. I have paid a good deal of attention to the subject, both as a commercial writer and as being identified with several papers. I am one of the editors of the *Journal of Commerce*, and identified with several journals of that kind, in which it has been my special business to pay attention to imports and exports. My evidence will therefore bear chiefly upon articles coming here and exported adulterated. I am not so well informed upon those which are vended at home; but I can give the Committee some information as to what is the custom in other countries, and what are the practices of adulteration which prevail in some of the places from which the articles are exported. Upon the fiscal question, probably, I may be able to show the Committee that the Government loses, in point of revenue, immensely by the practice of adulteration. Perhaps I had better turn to the fiscal question first, and give the Committee the result of a few notes which I have made upon the subject. This is an approximate statement; of course it is vague and indefinite, but it is deduced from the evidence which has been given by Dr. Hassall and others as to adulterations, which, from my own examination, occur in certain articles of general consumption which are subject to fiscal and Customs revenue. I will take them *seriatim.* First, the substances used in the preparation of dietetic drinks and beverages; coffee, for example. I published a few years ago a little work on coffee, which is entitled "Coffee as it is, and as it ought to be." I have had some experience on that subject, from being a coffee planter myself in the West Indies, and I looked a good deal into the adulterations which were practised. It was about the time the question was discussed and the proceedings adopted which have checked adulteration very materially. I estimated then that there were about 18,000,000 lbs. of various substitutes used fraudulently to replace coffee. Chicory is now subject to a duty, but there was a great deal of home-grown chicory then. I estimated that there were 18,000,000 lbs. used annually of various substances which fraudulently replaced coffee, at 4d. a lb.; that would cause a loss to the revenue of £300,000. If coffee were used instead of the adulterated article, it would produce that amount. I assume 10 per cent. of adulteration in the case of sugar; flour and sand and other materials are added to make up the weight of the sugar. I take it, in all those cases, that so much of the imported article is thrown out of use by the use of those substituted articles. I heard part of the evidence yesterday of Mr. Redwood, and I differ *in toto* with him. I do not believe a purchaser going for one gallon of gin to a distillery would get it at the same price as a publican who obtains a very large quantity. It was argued by Mr. Redwood that the practice was necessary to conceal the publicans' profits, inasmuch as the purchaser of a small quantity could obtain it from the distillery at the same price as a large quantity. Consequently, I think it fair to assume that the revenue loses the balance between the amount of sugar used and that which would be used but for the adulterations. With respect to sugar, I assume that there is 10 per cent. of adulteration on the consumption of last year, which was 8,000,000 cwt., the duty being 13s. 9d.; that would give you upwards of half-a-million revenue. The next article will be cocoa: assuming 10 per cent. of adulteration upon that (and Dr. Hassall says in 46 samples he found starch and other ingredients ranging from 5 to 50 per cent. of adulteration), the consumption last year was more than four-and-a-half million lbs.; the duty lost by this fraud, at 1d. a lb., would be nearly £2,000. I base my estimates on the lowest calculations, my object being to show that adulteration not only in a moral and social point of view, but in a fiscal point of view, is detrimental to the country. It has been shown that there are several adulterations in tea: it is difficult to arrive at the amount closely, but even if we had 5 per cent. of adulterations, the Government lose a great deal on that. This is not assumed adulteration upon the import, because the Government charges a duty upon all which is imported; but if the adulterated article were not in the market, and the Government were more watchful over the health and comforts of the people, a greater amount of revenue would result. The Government are too lax with respect to a great many articles which are imported. Taking 5 per cent. of adulteration on 62,000,000 lbs., which was the consumption of tea last year, at 1s. 6d. a lb. on the average, it will give £23,250 as the loss. Then I will take spices and condiments; ginger, in the powdered state, is at least half of it adulterated. The quantity entered for consumption in 1852, was 19,000 cwt.; it does not usually appear in the Board of Trade Returns; the loss to the revenue would be, at 5s. a cwt., £22,000. Pepper, again, taking only 10 per cent. of the quantity consumed to be adulteration, we have a loss to the revenue of £9,301. By the substitution of cassia lignea for cinnamon, a loss results to the revenue on the consumption of 1854, which was 124,173 lbs., of about £500. Upon nutmegs, again, there is a loss of fully £500., resulting from the substitution of wild nutmegs paying 5d. a lb., for the cultivated nutmegs paying 1s. a lb. Ground and mixed spices are composed very largely of adulterating ingredients which also defraud the revenue to a considerable extent. As to tobacco, if the adulteration averages only five per cent. on the quantity of duty paid in 1854, which was 30,544,533 lbs., the loss to the revenue at 3s. a lb. would be £22,917. I am under the mark, I think, in all my calculations. If you enlarge your margin of adulteration, you may even double the amount of loss. I have not included snuffs and cigars, and other things which I have not been able to get at definitely. We know that in snuff there is an immense amount of adulteration, but I have not been able to get at the figures. In the case of gin, we have heard that the adulteration is frequently 50 per cent. I will assume it to be 15. Carrying out that calculation on the whole quantity of British spirits consumed annually in the United Kingdom, which is nearly 25,500,000 gallons, at an average duty of 5s. 6d. per gallon, that duty would give you nearly half-a-million, £466,833. In the case of wine again, the consumption averages about 6,500,000 gallons; fully 20 per cent. beyond this amount may be fairly taken as adulteration. Wine is a very stationary article in point of consumption. The wine consumption averages about 6,500,000 gallons annually; fully 20 per cent. beyond this amount may be estimated as the adulteration; which, at 5s. 6d. a gallon, makes £357,000. The dilution or adulteration on foreign spirits consumed amounting to some 5,000,000 gallons in the proportion of only 10 per cent., and at an average of 10s. a gallon duty, the respective duties being 15s. and 8s. 2d., would show a loss to the revenue of £250,000. It has been shown also, that in the case of beer, the loss to the revenue from adulteration is £1,000,000. per annum. Mr. M'Culloch, an officer of Excise, has given evidence to that effect. There are numberless other articles, from the adulteration of which the revenue suffers; starch, arrowroot, and mustard: but the duty being very small, it is hardly wise to go into an estimate of the loss to the revenue, whatever the loss may be to the consumer. Those which I have given would amount to upwards £3,000,000, looking to the question only in a fiscal point of view.

With respect to spices, and the comparative duties upon them, I should like to lay a few observations before the Committee. Under the new tariff cassia bark is to come into consumption at 1d. the pound, while *cinnamon* is to pay 2d.; cassia lignea is much coarser than cinnamon, and has a camphoraceous flavour, less pungency, and is more mucilaginous. From Malabar, the Eastern States of Asia, China, the Philippines, and islands of the Eastern Archipelago, large supplies of cassia are obtained, which is palmed off on the public for cinnamon. In some years the imports have reached £2,500,000. It is very inferior bark to cinnamon, but it is always sold to the public as cinnamon; the public have very few opportunities of judging. You never hear of cassia bark being sold, though we know that it is extensively sold instead of cinnamon. This does injury to the cinnamon cultivator; it does injury to those who lay out a great deal of money in spice cultivation. In the last six years the cultivation of cinnamon has only increased from £32,732 to £54,000, whilst cassia has gone largely into consumption; the imports exceeding 500,000 lbs., whilst the quantity, duty paid, averages 130,000 lbs. per annum. It replaces the genuine cinnamon. If cinnamon bore the same duty, it would be preferred by the public, from being a better bark, with more pungency and more aromatic flavour; instead of that, cinnamon spice pays 2d., and cassia bark pays only 1d. With regard to price, the two articles are pretty nearly equal. As vended I believe there is very little difference; the cinnamon would be taken principally by druggists and confectioners, and those who really want a good article. There is not much difference in the appearance of cassia and cinnamon; not sufficient for the public to detect. If you go to a grocer and ask for cinnamon, you will generally get cassia. The duty received from cinnamon is so small, about £500, that it might at least be placed on an equality with cassia, so as to give the public the benefit of a better article for their money, and stimulate the cultivation in Ceylon. The bark of the wild or bastard cinnamon (canella alba), another cheap bark, is often sold as true cinnamon, and it comes in free of duty. Cassia powder is almost invariably sold for that of cinnamon. In a memorial from the nutmeg planters of the island of Singapore, transmitted to Mr. Gladstone when Chancellor of the Exchequer, they remonstrated against the injustice of permitting the importation of wild *nutmegs* into the British markets at the reduced duty of 5d. per lb., which gives them a great advantage over those grown in the Straits settlements, paying the higher duty of 1s. This bounty in favour of the wild nutmeg has served to introduce them largely into the London markets, and also the nutmegs of the Dutch Islands, passing as one and the same article, and commanding the higher price. The memorialists add, "that the real 'wild' nutmeg, although it resembles considerably in shape, mace, &c., the nutmeg of commerce is destitute of aroma and flavour, and is entirely without value as an article of trade; that the maintenance of two distinct rates of duty appears highly inexpedient, for the following reasons: first, if, as contended, the so-called 'wild' nutmeg, now admitted at the lower duty, is in all essential respects the same as that grown by the memorialists, the protection granted to the foreign production is a grievous injustice to the British planters; second, if, as a vegetable production, the so-called 'wild' nutmeg is a different article from the cultivated one, and of inferior value, its admission at a lower rate of duty offers great facilities and a strong temptation to the perpetration of fraud upon the British consumer, seeing that, as has already been stated, no such distinction between the two is known in the retail trade; the British consumer, therefore, does not reap any advantage from this lower rate of duty, and the British planter is injured by his highly-taxed produce being displaced in the market by this inferior article, the importers of, and wholesale dealers in, the wild nutmegs being the persons who most largely profit by the difference in the duty." That is an extract from the memorial, which, however, has had no effect, and the distinctive duty still remains as it did before. The wild nutmegs are invariably sold in the shops for the true nutmegs. The price of the cultivated nutmeg is high, in consequence of the expensive culture. The nutmeg tree takes a long time in cultivation. The ordinary public, who receive the wild nutmeg, have no means of testing the difference. The cultivated nutmeg sells at a higher price in bond than the wild nutmeg. It looks rather different, but the public, who buy them in small quantities, have very seldom an opportunity of knowing what is the best quality. Wild or spurious nutmegs can be bought at about 10 dollars the picul, which is 1⅓ cwt. at Singapore, brought in by the native boats from Borneo, Celebes, and New Guinea; while cultivated nutmegs have never been below 60 dollars the picul, owing to the expense of culture, and the time required to arrive at full bearing. Although nearly devoid of aroma, the wild nutmegs are extensively substituted for the true spice. The holes of bad nutmegs, bored and injured by insects, are filled in with various substances to deceive purchasers; that is, to render them passable for sale. That, perhaps, is not an instance of adulteration, strictly speaking, but it is to make them bear a better appearance in the market. Wild mace is occasionally used for adulterating the true mace. At first sight it is not easily to be distinguished; the colour is exactly alike, but it has not the least spicy flavour, and when chewed has a kind of resiny taste.

Black pepper is notoriously adulterated; long pepper, pieces of the stem, and other foreign substances are ground up with it. I have seen a species called coriander pepper, which, being cheaper than the genuine white pepper, is sometimes ground up with it. Cayenne pepper comes here principally in the pod; it never comes ground. The principal pepper used for cayenne pepper is small bird pepper. Capsicums, and those which are grown larger, are used for condiments abroad, but seldom come here for the purpose of cayenne pepper. Cayenne pepper ground in this country is adulterated by the persons who have the manipulation of it; it would never be adulterated abroad; it may come in small quantities ground; but they have not the conveniences for pounding or grinding it that we have at home. I cannot speak, generally, as to the adulterations which take place in this country. I have made some inquiries upon these points in the course of forming a trade museum for my own use, and frequenting brokers' sale-rooms in the City, but I cannot speak generally as to the practice in that respect.

With regard to the state of the law in other countries with a view to checking these adulterations, I have copies here of the American law, to which Mr. Herring alluded just now, for the inspection of commodities which are imported. If the Committee will permit me, I will here make some suggestions which occur to me as to the checks which I think might be put upon the importation of adulterated articles. The Excise regulations, as respects articles of much consumption, appear to me comparatively obsolete, and far behind the requirements of the age. There is too much laxity and injustice on the part of the Treasury, which sanctions admixtures and adulterations in a variety of instances, as in the case of chicory and coffee, cassia and cinnamon, wild and cultivated nutmegs, and other articles, but is most virtuously indignant at adulterated tea, tobacco, snuff, and other heavily taxed articles. The officers of the customs are, generally speaking, extremely ill-informed as to the quality and purity of various articles imported, such as starches, oils, drugs, &c. I consider it would contribute greatly to check adulteration if thoroughly competent examining officers were appointed at each of the principal ports, whose duty it would be to examine and report upon the quality of all articles introduced, whether for manufactures or food, but especially the latter, instead of submitting samples, as is too frequently the case at present, to interested parties. In most of the principal States of Europe there exists a Board of Health, or Conseil de Salubrité (somewhat differently constituted to our Metropolitan Board), composed of eminent physicians, chemists, and engineers, appointed to watch over whatever may affect injuriously the public health and comfort. In France this commission consists, for the capital, of seven members, who have the surveillance in this respect of markets, factories, places of public amusement, bakeries, shambles, secret medicines, &c. In England we have excise officers charged to protect the revenue, and some few inspectors of nuisances, but no general body and branch agencies, whose duty it should be to examine into the wholesomeness, purity, and good quality of the common articles of food of the people, who have in too many instances neither the skill to detect adulteration nor the time or money to devote to prosecution when such frauds or misdemeanors are detected. In the Prussian municipal law there are some very wholesome enactments with regard to the sale of spoilt or adulterated victuals. They recite that "no person shall knowingly sell or communicate to other persons for their use articles of food or drink which possess properties prejudicial to health, under a penalty of fine or bodily punishment. Whosoever adulterates any such victuals in any manner prejudicial to health, or mixes them with unwholesome materials, especially by adding any preparation of lead to liquors, shall, according to the circumstances of the case and the degree of danger to health, be liable to imprisonment in a correction-house or in a fortress during a period varying from one to three years. Besides this punishment, those who are found guilty of knowingly selling victuals which are damaged or spoiled, or mixed with deleterious additions, shall be rendered incapable for ever of carrying on the same branch of business. The articles in question shall be destroyed if incorrigibly bad, but if otherwise they are to be improved as far as possible at the cost of the culprit, and then confiscated for the benefit of the poor. Further, whosoever mixes victuals, or other goods, with foreign materials for the purpose of increasing their weight or bulk, or their seeming good qualities, in a deceitful manner, shall be punished as a swindler." The American law to which I alluded, came into operation in 1848. It was a law to prevent the importation of adulterated and spurious drugs and medicines; large quantities of them were shipped from this country and from France, and they were so wretchedly compounded as to be positively injurious. The Americans tried to stop the introduction of them at the outposts, but I am not aware that they carried it into operation in the inland towns. They appointed a qualified inspector at each of the outports, who was to examine and report upon all which fairly reached the standard, and to re-ship all those which were deleterious, or which were not of the proportionate strength. The result was, that a large quantity were refused within a short period. I have here a report from the trustees of the College of Pharmacy in New York, of the quantities they confiscated, and they speak here of various adulterations. The general result was that blue pill, oxide of zinc, and a variety of other things were found to be injuriously compounded for the Atlantic cities; orders came home from druggists to a merchant instead of coming to a wholesale druggist; the merchant, wishing to obtain his profit, ascertains what the things can be supplied for, and not being a judge of the quality of them, thinks that that which can be obtained cheapest will answer his purpose best. The colonies, I think, suffer even more than the home public; parties who go and establish themselves as chemists and druggists out there are not always a superior class of men; any person almost may start a chemist and druggist's shop in the colonies. He has to get his goods through a merchant there; the merchant has his correspondent in London; he sends to him. There is a double profit to be obtained before the goods reach the druggist's hand. If the druggist were able to order his goods himself, he would probably get them purer than he does. I think that if once a check were put upon adulteration in this country, many of the colonies, for their own sakes, would adopt the same course there. The confiscation of drugs in America has been immense, and it has had a very beneficial effect. They themselves admit that the number of articles imported, of an adulterated character, are very small compared with what they were. They are not so much manufacturers of drugs as we are. Ourselves, and France, and Belgium, I believe, prepare the principal of the finer preparations of pharmacy, and the Americans depend very much upon us. In some of the articles I speak of, there was only one-tenth or one-twentieth of the pure commodity. I do not know that that applies to all, though the adulteration in all articles is very extensive.

There is one matter which occurs to me as being exceedingly singular, which is, that the consumption of malt and hops continues stationary, though the consumption of beer, with the increasing population, must have increased very largely. For the last fifteen years there has been scarcely any variation in the amount of hops consumed, and some substances must, therefore, be used very extensively to make up the difference. With the large and increasing trade and consumption of malt liquors, and the fluctuations in so uncertain a crop as hops, for which even an export demand has now arisen, it appears to me that attention should be directed by our chemists to some other legitimate ingredient for brewing, calculated to supply the tonic and bitter lupuline principle requisite. It is not all soils that are suited to the culture of hops; and the extent of land under cultivation in the last three years has averaged 50,000 acres, being only 7,000 acres beyond the culture of 30 years ago. The home production in the last ten years has scarcely increased at all, and yet the shipments of beer and ale have more than trebled in value, and the home consumption must necessarily have increased also. What, therefore, takes the place of hops? The quantity of foreign hops charged with duty last year was only 4,600 lbs., a very small addition to the home-grown quantity. In the ten years ending with 1853, the consumption of malt liquors increased about 34 per cent., or nearly 75 per cent. more than the increase of population in the same period; and yet the quantity of malt charged with duty has remained stationary in the last fifteen years, or if anything, declined, the quantity consumed in 1840 having been about 42½ million bushels, whilst last year it was under 37 millions. The export and consumption of beer having been increased, and the yield of hops not increased in proportion, some substances must have been used instead of hops. I do not say whether they are necessary or proper. Among the substances which I should suppose are used to adulterate *beer*, are camomile and chesetta root, to impart bitterness; grains of paradise, to give pungency; and sweet flag-root, to impart a peculiar flavour, after that of some celebrated localities. In the suburbs of London, I may mention that it is a common practice with the publicans to adulterate beer on Saturday nights much more than on other nights, and with very deleterious ingredients. I know from relatives of my own, who have given me evidence, that diarrhoea and those diseases are prevalent on Sunday much more than other days, in consequence of the beer which has been bought on Saturday night. Whether it is to induce thirst that some noxious ingredients are added, I cannot say. The cases of drunkenness which occur on Monday have been very much the effect of those noxious and stupefying products, which are added more on Saturday and Sunday than on any other day. A few other ingredients come largely into this country, which, it has been stated, are some of them used for the purpose of imparting a bitter to beer.

Quassia, or bitter wood, an intense bitter, obtained from the West Indies and Central America, which was formerly prohibited by law from being employed as a substitute for hops in brewing, by a restrictive duty of £8 17s. 6d. per cwt. being levied on it, is now again encouraged, being admitted under the present tariff at 1s. per cwt. The extract of this and other ingredients is liable to a 20 per cent. duty, but they very seldom come in that shape. Cocculus indicus, another intoxicating drug, is also favoured by a reduction of 80 per cent., and at least 250 tons are annually imported, chiefly, I suppose, for the use of brewers. Cocculus indicus pays a small nominal duty. I believe the price has considerably increased of late; I understand so from chemists and from friends of my own. The inference is that that is owing to its use in adulteration. I cannot state it as a fact. Nux vomica again, another narcotic seed, comes into the country in about the same proportion, and is only subject to a duty of 2s. the cwt.; 200 to 300 tons of the hot, acrid seeds of cardamoms, or grains of paradise, are also annually imported, and chiefly used to give an artificial strength to beer and spirits.

There is one point which I think I may here allude to. It appears to me that the suppressive measures which have been passed with regard to beer, and the attempts to induce temperance, have driven parties to the consumption of opium. The consumption of opium appears to me to have increased very largely. I do not know whether opium has come into use for the purpose of producing intoxication in the manufacturing and other districts. It appears to be largely used for that purpose in America. I had occasion, some time ago, to trace the consumption of opium, and it appeared to me that the quantity used, whether it is for medicinal purposes or other purposes I cannot say, was very great I do not know where the opium goes. I am not at present prepared to show that; but my information certainly shows me that the consumption is much larger than would be required, I should suppose, for medicinal purposes. I think, on an average of the last three years, 63,000 lbs. of opium have been imported. I only take that which is consumed in this country. I differ from Mr. Redwood, in the evidence I have heard, that Indian opium does not come in here. I think it does come in. I am not aware in what quantities. I have not heard that there are any suppressive measures to prevent opium coming to this country by the East India Company; they have certain regulations, but I have not heard that Indian opium is inferior to Turkish opium. Mr. Herring, I think, said it was equal. The Americans carry on a large trade with China, and opium goes from the East Indies to China, or to the colonies and other countries. The return does not show the sources from which that opium is supplied. I admit that opium was prescribed in much larger quantities during the prevalence of the cholera of late years, but not to an extent to require so many more pounds. The production of opium in Bengal alone exceeds 5,000,000 lbs. per annum. In America it appears to be used largely; here is a paragraph from the *New York Evening Post*, a communication from a private source, calling attention to the increased use of laudanum by many young persons of that city, who procure it, the writer says, in large quantities at the druggists', and swallow it like water. There cannot be a doubt that of late years the consumption of laudanum and opium has greatly increased, especially in the Atlantic States. It would be well if some method were devised to put a check to the growing evil. In Europe its sale is forbidden, except under order from a physician.

The Apothecaries' Company used to have authority under their charter to inspect druggists' shops; whether that has lapsed I am not aware; I think it is used conjointly with the College of Physicians. The College of Physicians, I believe, possess the power of visiting druggists' shops and inspecting drugs, and confiscating those which are impure or adulterated, and fining according to the frequency of the offence; but I believe no such check exists in the provincial towns. They exercise this privilege very seldom; they do it occasionally in London even now. It appears, however, to have gone into desuetude, but I think that it might be carried out advantageously both in the suburbs of London and in some of the provincial towns. There are frequently clearance sales at the docks, and sales of sea-damaged or injured goods at the offices of the City brokers, where articles of a most worthless character are bought to be mixed with better articles, either for home use or exportation. It appears to me that those go generally into consumption somehow; whether they are used for adulteration with other articles, or whether they are used for the purpose of sending out of the country, I am not aware. I have heard what has been suggested by other witnesses, that we should have a system of inspection; at the seaports I think there should be such an officer. I do not know how it is to be carried out in towns generally; people do not like a system of espionage or examination. It would be desirable to appoint an officer who could be referred to in case of a charge being made against a person selling impure things; he might not go round constantly for the purpose of examining goods in shops, but he might be there qualified and ready to be referred to. I think that would have a good effect; the fear of publicity would, I think, have the greatest effect in checking adulteration. It would not be necessary to impose heavy penalties, looking to the great mischief it would do to any tradesman to be detected. I quite agree with former witnesses that a great deal of adulteration is done abroad. I was talking to the manager of the Gutta Percha Company some time ago on that fact; he says they have learned to adulterate that material; that they put stones and iron into it; he even found a cannon-ball in one of the lumps of the article.

I have said that people would consume more of the imported article which pays duty if adulteration was prevented; I should add that the competition of the different producing countries is such now, that you would get more than you need of sugar, and coffee, and other articles of the kind; the supply is greater than the demand, and if you increase the demand, you will increase the sources of supply. That has been the case with many articles; with increased demand the price has fallen. It may injure our own colonies in some measure, because many of them have not the advantage of labour. In the East, where labour is very cheap, they are able to produce at a lower price than the western colonies, having less advantages, can do.

There are a few articles of provisions which have come under my notice; *flour* from America, for instance, in which a great deal of adulteration goes on. The flour gets musty, and a great deal has had to be re-shipped to America, and the Americans have called the attention of their own people to it. The imports into Liverpool of American flour are very large. They average about 800,000 sacks annually, much of which is sea damaged, musty, or adulterated, and over which there is no supervision. Indian corn gets very bad indeed, unless kiln-dried. They have lately beg to do that; but formerly it was not done; it came over in a very deteriorated state, and I have no doubt it contributed to a very unfavourable state of health among the Irish people, who principally consumed it. Dr. Beck, in an official report on the breadstuffs of the United States, made to the Commissioners of Patents, a year or two ago, states that mixtures of damaged, inferior, and good kinds of flour had been largely exported to Great Britain. The injury to health by the use of these sour and sophisticated flours must be very considerable, when we remember that the imports into Liverpool alone of American flour amount annually to 800,000 sacks; that was the official report of the officer appointed by the American Government themselves. They have at some of the American ports an officer, who is appointed to examine and to brand such as are considered first class and second class, according to the quality, but that is not compulsory. Parties who choose to avail themselves of it do so; and it enhances the value of the product when it arrives here; but even that is liable to fraud; the casks are branded and re-filled, and done up in such a way as to deceive the purchaser. With respect also to *salted provisions* coming over from America, they are very often in a very bad state, and there should be some supervision of them. There is no person whose duty it is to report upon them now, and they come into consumption in a very injurious state. *Lard* has been already spoken of; that is very largely adulterated in America with flour and some heavier ingredients; flour is one of the main ingredients used in the adulteration. Preserved provisions, also, it requires some revising officer to examine. With respect to milk, again, even the Americans themselves are turning their attention to it. Milk is in such a bad state in some of their cities, owing to the nature of the substances on which the cows are fed, that very bad effects result to the public health. In the course of inquiries made a year or two ago, by a committee of eleven appointed by the Academy of Medicine of New York to inquire into the effects, approximate and remote, on the general health of the city, arising from various nuisances and adulterations, they were specially directed to investigate the milk question, so fraught with important results, for to the sale of impure milk must be attributed much of the infant mortality in large cities; and in the Report drawn up appears this resolution: "That, in the opinion of this Academy, the milk of cows shut up in stables and fed on distillery slops is not only less nutritious than that of unconfined and well-fed animals, but is positively deleterious, especially to young children, and is a fruitful cause of many fatal diseases." I think there is a great deal of bad milk vended in London, in consequence of the close confinement of the animals. Evidence has been given by others who have investigated the subject, to show that diseases are prevalent in the teats of the animals which it is appalling to think of, and the milk must be necessarily injurious to health. The same is the case with other things which are consumed in some of the low neighbourhoods of London. Anyone who is continually in the habit of passing through them must see the spoiled meat, which all goes to the chopping machine, and is made up into *sausages*. An officer at Birmingham some time ago found that a great many of the horses and other animals which died there were made up into sausages.

Oils, again, are very much adulterated; there is not an oil which comes into commerce for manufacturing purposes, or for use by the public, which is not mixed with some other oil which is not so valuable. In consequence of the large quantity of oils used at the present day for machinery, woollens, &c., many varieties are introduced into the market, and thus much temptation exists to mix or adulterate the more expensive of them. *Fish oils* exclusively assume a brown or black tinge when a stream of chlorine gas is passed through them. The specific gravity of oils affords a very simple, and, what can be said of few other oil tests, a very satisfactory method of detecting some of the adulterations to which they are subject. *Sperm oil* in particular is distinguished by its low specific gravity; it is usually adulterated with southern whale oil, and some other oils which mix equally with it. *Olive oil* is a large article of consumption; it is mixed with nut oil and poppy-seed oil, which has a stupifying and injurious effect upon the health; it has deleterious properties which ought not to permit it to be brought into consumption at all; but there are no means of determining whether it has been adulterated at home or abroad. The Italian oils are so dear that various productions have been mixed with them, some of which are, I have no doubt, exceedingly prejudicial to health.

EVIDENCE OF JOHN POSTGATE, Esq.

I am a surgeon resident in Birmingham, and I have devoted a good deal of attention to the question of adulteration. For the last two years I have been engaged in testing and analysing the different articles which have come under my own notice, and I have taken considerable pains in interesting the public in this matter during the last year or two. I communicated with the Chairman on the 7th of January last year, suggesting the appointment of a public analyser, and also that an Act of Parliament should be introduced, to check adulteration. My attention was attracted to the subject by the effect produced on a patient by adulterated coffee, which produced a very violent purging and vomiting, and also by the state of the bread at that time in Birmingham. I called some meetings in Birmingham, and I entered into an extensive correspondence on the subject with some of the leading chemists and scientific men of the country, wishing them to aid in the matter. I recommended that a public analyser should be appointed by the town councils of large towns and cities, and by the county magistrates for districts. I also suggested the appointment of the present Committee of Inquiry.

I have found alum in *flour* in all the samples I have examined, except in one instance, and that was supplied to me by the Birmingham Flour Society, an institution established for the supply of pure flour to its shareholders. Those samples have been tested continually since January last year. They were samples which came into my own house, and were obtained from other individuals by myself. Alum exists in a free state in flour, and can be readily separated by mixing the flour with water, and filtering the mixture. In one case, by filtering and evaporating, I was able to obtain 10 grains of alum from 100 grains of flour. A quantity of flour was supplied to a magistrate at Evesham of an unsound description; it was returned as unsound, and unfit for use. The dealer, who was a miller in the town, having a quantity of alum powdered, threw into the flour so returned a large quantity of that alum. The consequence was that it was totally unfit for use, and the inmates, who partook of some provisions made of this flour, were affected with illness. A surgeon resident in Birmingham brought a quantity of it to town and submitted it to my inspection. You could taste the alum in the flour, aud on mixing it up with water and evaporating it, you had crystals of alum formed; that would not be the case probably with the entire flour, but it was badly mixed; the alum was thrown into it in a careless way. Alum was the only ingredient I ascertained to be present in that sample; it was added for the purpose of making the flour sound. I have here a certificate from a person who was engaged in the practice of adulteration. He states that he became very ill in consequence of inhaling alum dust during the process of grinding. He states: "I have been a miller twenty-five years, and during that time have worked in numerous mills in various parts of England, and can certify that alum to a large extent is regularly ground up with wheat. I have ground alum separately, and mixed it afterwards with flour. Beans also are continually ground, and mixed up with wheat flour, when the price of wheat is high. My health is in a bad state in consequence of the alum-dust given off during grinding. I feel that I shall never be able to follow my trade again, and make this statement for the public benefit, and also to prevent injury to other workmen." This was witnessed by myself and by a solicitor of Birmingham. The man had been employed by various dealers in flour, in the Midland Counties especially, and he says they all mixed their flour. He furnished me with the names of the parties who did it. I may state to you the effect of alum upon my own constitution. Persons may suppose that they are affected by alum in *bread* when it may be from another cause; however, speaking for myself, I have had bread containing alum. I have had a loaf of bread in my house containing 3.5 per cent. of alum. That is a large and unusual quantity of alum in bread. The quantity in bread I should suppose would be one part in 400. That quantity I consider injurious. The effects upon the system which I have observed are these: The gums become swollen, an unpleasant taste in the mouth, the tongue more or less swollen, and the stomach itself affected. There is a quantity of acid secreted, and the individual suffers from an attack of dyspepsia without knowing the cause. Probably he changes his baker, or gets a fresh sample of bread, and the attack subsides; but by the repeated introduction of this alum into the system, he is more prone to another attack; it seems to accumulate as it were in the system; at least that has been the case with myself. The quantity of alum introduced by bakers generally varies very much. I have mentioned already that I have met with one case in which there was 8½ per cent. The average quantity I am not prepared to state. I believe the regular consumption, even of a small quantity of alum, is injurious.

With regard to bean and pea meal in flour, I believe they are very injurious to delicate persons. They produce flatulency and acidity of the stomach. Indian corn in flour is very injurious to delicate persons. I have found beans mixed with flour, so as to be perceptible to the palate. There was a statement made by the Mayor of Cork, a gentleman who communicated with me early in this movement with reference to the state of corn in Ireland, which had undergone a kind of decomposition, and was quite unfit for use. I am in a position to verify that statement; and I can do so by producing a witness to the Committee who was a party in grinding up a quantity of corn which had been warehoused for, he told me, six or seven years, which had undergone a kind of decomposition, that positively when it passed through the mill and was dressed, it fell through the fingers, as he stated, like lime. He watched the effects of the consumption of that flour, and he stated to me that it had produced bowel complaint wherever it had been consumed; that it was unsaleable in this country, and had been sent to Ireland. This occurred three years ago; I had a communication from a Mr. Rimmington, an analytical chemist, of Bradford, in which he stated that he discovered some sulphuric acid and oxide of iron in bread; the adulteration of flour with alum in that district had been prevented by the imposition of fines upon the parties. Not many years ago an accident occurred at Kidderminster by acetate of lead being introduced into flour instead of alum, and very serious consequences resulted. Persons, I believe, are still living who suffered very considerably, in consequence of the poison being introduced into the system. With regard to bread, I may mention that it is sold to the poor very deficient in weight. Mr. Alfred Hill, of Birmingham, found quartern loaves, when sold, five, and six, and seven ounces short in weight. I have myself paid some attention to this subject, as it concerns the poor. One of those loaves which was deficient in weight, by evaporation, lost nearly 50 per cent.; the alum could be tasted in it, proving that alum in bread enables bread to retain more water: 100 grains contained 3½ grains of alum. Now, 100 grains of household bread, that is, bread without alum and without potatoes, lost by evaporation 41 grains; and 100 grains of baker's bread, of the best kind, containing alum, lost by evaporation 43 grains; another 100 grains of baker's bread lost 45 grains in weight. I may state that the majority of the inhabitants of a large town are not aware of the natural colour of bread. A bakery was established at Birmingham to supply the public with genuine bread; the company met with very great opposition from the public on account of that. They had to explain to people that bread was not naturally of a white appearance, but of a yellowish colour; and they had considerable difficulties in establishing their business, though they sold a bread which was very wholesome indeed. It has been stated here that alum is added to bread to give it a whiteness, and to enable it to carry moisture and to bear the addition of potatoes. I would state that the double addition of alum renders the bread more injurious, it being first put into the flour, and then some more being added to it by the baker. I have mentioned the effects of alum on the gums; I believe it has a pernicious effect upon the teeth; the gums shrink, and ultimately, with delicate persons, the teeth fall out. There are several trade names for alum; one of them, being very characteristic of its effects on the mucous surface, is "roughs," and another is "seasoning."

With regard to potatoes in bread, gluten, the nitrogenous element of bread, is the element which makes the fibrine of the blood and the muscle, and contains nitrogen. Starch does not contain any nitrogen, and by adding starch, of course, the gluten is diminished, and the nutritive quality of the bread diminished. I have a statement here from a person who says, "I have lived seven years at Leicester with a baker and grocer, and have noticed the adulteration of bread there with both whiting, alum, and potatoes. I have fetched whiting and alum, and have mixed them with potatoes, and made it into bread with flour. After it had been worked with yeast into a sponge, this bread was sold at the same price as other shops. My master bought nearly a ton of whiting at a time, and two or three cwts. of alum. He used the small round potatoes, which were boiled, unskinned, and then washed in a tub; afterwards put on a sieve, water poured over them, and the skins separated. Then the alum and whiting were adde in large lumps to the potatoes and water, and afterwards it was mixed with the flour which had been worked with yeast: it was then made into bread and baked. The potatoes made the bread work better; but if the alum and whiting were mixed with the flour before it was fermented, the bread was dark and heavy, one bushel or more of potatoes to a sack of flour used. My master had bread made for his family without alum, whiting, or potatoes; but all the bread sold contained these articles, which he told me he could not make bread without, and he ordered me to put them in. I lived at a baker's at a village in the Midland counties, and they used the same articles in the same way. My master at Leicester used to mix starch with the arrowroot." Of course, the injurious consequences resulting depend very much upon the position and constitution of the individual. If the individual is a clerk or a literary person he will be more affected, having bad air to breathe and taking but little exercise; whereas, a strong, robust, country person would suffer less. But I conceive the repeated use of alum in bread by the inhabitants of large towns to be one great cause of dyspepsia. This is especially the case with young children, and it is the cause of the great consumption of purgative medicines. The most simple means by which the public could detect alum in their bread is by taking a slice of bread and placing it in a basin, pouring over it a quantity of boiled rain water and allowing it to remain some time, then filtering the solution, and adding a little ammonia or hartshorn; the alum will appear as a cloudiness in the fluid, and ultimately will subside to the bottom. I have been told that another practicable mode is, by introducing a hot knife into the centre of the loaf: if it adheres to it, it is a sign of the presence of alum. The bread made from alum is light and unsubstantial: it is stated by many persons who consume it not to be satisfying. In Paris the bakers are under the control of the municipal authorities, and I think it exceedingly beneficial to the public. To such an extent has the adulteration of bread proceeded in this country, that men in the trade have sent messages to me, stating that they would not be interfered with in their business; that they had introduced alum and potatoes, and they would continue to do it. I am aware that there is an Act of Parliament by which a miller, or any person having improper ingredients for the purpose of mixing with flour, is liable to a penalty of £10 for having those ingredients; and then he is liable to a penalty of £20 for every sale he makes of the mixed article; but you have no person to detect those adulterations. There is not an analyser appointed for the purpose of examining the bread, and the poor are entirely without remedy; they cannot employ an analytical chemist to test their provisions; the majority of persons are not aware that they are adulterated, and they consume them, though they may be injurious. For example, there are very few persons in the large towns who know that there is the quantity of alum in bread which actually exists. Latterly the matter has been elaborately investigated through the Sanitary Commission of the *Lancet*, but those reports have been sealed to the public till they have lately been made use of. I think it desirable that there should be some officer having the character of a public prosecutor; if there were some person whose duty it was to look after these matters, that would put a decided check upon the practice of adulteration. No doubt information would be furnished to the public prosecutor by private individuals. If we had a chemical inspector attached, either to a union or to a Board of Guardians, or to a Board of Health, or a Board for removing nuisances, he might investigate these matters, and enable some public officer to prosecute. The mere fact of such an officer existing would be sufficient to deter many men from adulterating. But till there is a proper officer appointed by the local authorities, and under some kind of control, not under the influence of the local parties, and a punishment is imposed upon the practice, you will have adulteration prevalent. Parties who have been several times convicted of having short weights and measures, even so many as a dozen times, are not deterred from having those short weights and measures; and I would suggest that a punishment should be inflicted; not a mere fine, for then it becomes a matter of calculation whether it will pay the party to be fined, and to adulterate. A man who adulterates bread or other articles of food, I think commits a very great offence. I think a distinction should be drawn between pernicious and harmless adulteration; harmless adulteration I would consider a swindle; but I think a person guilty of pernicious adulteration ought to be imprisoned, with the addition of a little hard labour; and the more educated the criminal, the greater should be the punishment. The practice of adulteration is a practice for the benefit of the party resorting to it at the expense of the purchaser.

FRIDAY, August 3rd, 1855.

EVIDENCE OF CHARLES H. BURTON, Esq.

In the year 1840 a Treasury Minute existed, which enabled chicory to be sold mixed with coffee without any restriction. Messrs. Duckworth, of Liverpool, took out a patent for certain improvements in the manufacture of chicory, and for compressing chicory into the form of berries, or any other arbitrary form. I had occasion about the year 1851 to take a sample of those berries, and when mixed with coffee, although to any one well acquainted with roasted coffee, the difference might be observable, to the general public I do not think it would. They were in the form of coffee berries. I never saw them in any other form. I do not think the machine was very extensively used; I am rather inclined to think that the patent did not yield a very large remuneration. The berries I saw were evidently intended to imitate coffee, and succeeded very well, I think. I saw these imitations of coffee berries mixed with coffee; but I do not know the proportion of false berries mixed with true coffee. I have not minutely looked into that portion of the subject, but I should think a very small proportion, certainly not so much chicory as coffee. I do not think at any time the extent of mixing was so great as is practised in the ground state.

EVIDENCE OF GEORGE PHILLIPS, Esq.

I am Chief Officer of the Chemical Department, under the Board of Inland Revenue, and have been connected with that department thirteen years. The articles which specially come under my supervision in the character of chemical analyst to the Board, are beer, pepper, coffee, chicory, tea; soap did so until recently; tobacco, hops, spirits, British and foreign wines, vinegar; and there are a variety of other things which come from the Customs, and sometimes from the Ordnance and various other Government departments. It is the duty of my department to examine those articles, to see whether they are or are not adulterated. I have alluded to some articles of Customs; if there is a dispute as to the proper nature of an article, it is sent to us to know what it is, and upon that report the Customs act. With regard to Customs articles, we do not so much examine the adulterations as endeavour to ascertain what the articles themselves are. It is a question entirely between the trader and the Customs. An article is sometimes entered under one denomination, and turns out to be another.

I will read to the Committee a return I have for the last 11¾ years. It commences on the 30th of October, 1843, and comes up to the present time. In the 11¾ years, 1,139 beer samples were examined; pepper, 1,116; coffee, 12,483; soap, 187; tobacco, 1,616; hops, 40; spirits, 105; British wines, 47; foreign wine, 2; vinegar, 1; samples from the Customs, &c., 390; and tea, 142. The total number of samples examined, according to this return, is 17,268. In the peppers, $51\frac{6}{10}$ of the samples sent up were found to be adulterated; coffee, $12\frac{9}{10}$; tea, $54\frac{2}{10}$; tobacco, $64\frac{1}{10}$; hops, $87\frac{5}{10}$. I should say that those hops were taken from the breweries; they were supposed to be adulterated, and were sent up by the officer and examined. Our practice is this: the officers, if they suspect a trader of adulteration, go and procure samples. Many of them are competent to examine samples upon the spot, and they do so, as in the case of coffee and pepper; if they have any doubt of their own judgment, they take samples, and send them to the laboratory to be further examined. This is a return of the samples sent up under those circumstances. We have beer sent up for the purpose of ascertaining the gravity at which it was brewed; that is, the weight of the wort; upon that weight the drawback is allowed on the beer which is exported. It is averaged to meet the malt, and according to the strength of the beer so is the drawback; a large number of those samples were sent up under those circumstances. There were only 12 samples of beer out of that large number which were proved to be adulterated; when those samples pass through our hands, we not only ascertain the original gravity of the beer, but if there was anything peculiar in the beer we should also make an examination of it, and if we found it adulterated we should take steps against the brewer, on grounds quite distinct from the question of drawback.

Soap has passed from our hands at present; the chief adulteration would be impurities in the shape of sulphate of soda, common salt, and so on.

With respect to beer, out of the large number of samples there were only 12 which were supposed to be adulterated, and they all turned out to be so. Most of the 40 samples of hops I have spoken of contained grains of paradise; in one instance we had cocculus indicus, but only in one instance; and there was one of tobacco. Unless we had suspicion, we should not examine beer. We have a Detective Force to look after those things, and if they suspect a publican of adulterating his beer we should examine it. We have had several cases of mixtures, which have been found in the publican's possession, for the adulteration of beer. It is chiefly common salt and sulphate of iron that are used, and also quassia. The practice is to examine the cellars of the publican at such times as they think most likely to detect anything; sometimes they succeed in finding those mixtures, or they may find the man in the act of mixing the beer. The offence to the revenue is the loss of duty; they are robbing us of the malt duty. They have a right to sell what they please, provided it goes into their possession as beer; but when they use mixtures they also add water. The object of this is to enable the publican to make a larger quantity of beer; to make 100 gallons, for instance, 150. It is against the tenor of the licence to adulterate the liquor he sells, and it is an offence for a man to keep a mixture in his cellar. We can easily detect whether water is added; it brings the beer to a lower standard. We invariably lay an information when we detect those adulterations. I have no account of the number of informations which we have laid. This number would not represent the informations, but the samples; it is possible that one trader might have had 10 samples. The fine for mixing beer, I believe, is £200; but I am not very well acquainted with the law. Convictions have in most cases followed the informations laid by us; it is a rare thing that we lose a case, not one out of 200 or 300.

Our officers are frequently directed to go out and bring samples promiscuously. A trader may be thought to be selling something which is impure; in that case instructions are sent down to the supervisor to take such measures as he may think necessary to detect the fraud. There is a staff of chemical officers belonging to the Board. I think in my department there are six; we have already about sixty or seventy well educated men for the United Kingdom. They are not all resident in London. They are stationed at the outports, and at various places where they are thought to be most usefully employed. Those officers are educated as analytical chemists, and all that I know I have reason to be satisfied with. We have fourteen students at University College, studying with a view to become officers under the Excise. The first information we get concerning adulterated beer comes sometimes from the customers of the adulterating publican; but the chief part of our samples are procured by our own officers. If a man is suspected, it is the duty of the officer to look after him.

With respect to *coffee*, as the law stands at present, a trader can sell a mixture of chicory and coffee provided he prints on the package, "This is sold as chicory and coffee." When a person asks for genuine coffee the trader is held responsible that the article shall be genuine. In this return a great many of the samples were bought as mixtures; some were bought as genuine. It was no offence if it was a mixture, provided he complied with the law, and had the label legally printed so that it shall catch the purchaser's eye. It is sometimes the case that he puts the notice in such small letters, or on such part of the package that it would not attract the notice of the purchaser. Then we should proceed against him. This infraction of that regulation is common. It is either folded under the package, or mixed with some other printing; in that case the trader is proceeded against. The total of the coffee cases was 12,483; the chief of those have been from the 30th of October, 1852, up to the present time. From the 30th of October, 1852, inclusive, to the 29th October, 1853, there were examined 5,276 samples; of those there were purchased as coffee 3,378; 2,890 were found genuine, and 488 adulterated. The number of mixtures purchased in that year was 1,898; 904 were found properly labelled, 283 not labelled at all, and 19 were found to contain other substances than chicory. From the 30th of October, 1853, to the 29th of October, 1854

4,642 samples were examined; of those 3,434 were represented as genuine, and, on examination, there were found to be 2,910 genuine, and 524 adulterated; of the mixtures, 1,208 were purchased, 882 were found properly labelled, 265 improperly labelled, and 61 not labelled at all; no other substance than chicory was found. From the 30th of October to the 30th of July, 1855, 2,530 samples were purchased; of those 2,069 were purchased as genuine, 1,954 we found to be genuine, and 115 adulterated; of the mixtures, 461 were purchased, 436 were found properly labelled, five improperly labelled, and 20 not labelled at all, and no other substance was found in them; the chief part of the coffee samples, therefore, have been within the last 2¼ years. We have found a great difference in these various packages as to the proportion of chicory to coffee. In 1853, the average per centage of chicory was 20·41; in 1854 it was 16·75; for the three-fourths of the year, up to the end of last July, it was 17·87. The invariable practice in the trade, I believe, is this; if a person asks for coffee, he is pretty sure to have the mixture of chicory and coffee; we do not hold the trader responsible unless he is asked for genuine coffee, but if he sent it out unlabelled we should proceed against him. If you trace the history of chicory you will find that, prior to the year 1832, we had heard nothing of its use in this country; it had been gradually going on for some years, but by insensible degrees, till the year 1835, it had arrived at such a height that the Board proceeded against a trader in Liverpool. This proceeding was stopped by an Order of the Treasury. Then there was a Treasury Order not allowing the mixture of chicory with coffee. That went on till the year 1840, when steps were again taken to prosecute a party, but were annulled by the Treasury by an Order of the 31st of August. From that period we have gone on allowing persons, till recently, to put chicory into coffee. Now, the regulation I have named is that they must state that it is a mixture. We allow this indulgence to the trade, if they comply with our regulations. We think that every man in this country is now pretty well enabled to read and write, and as we insist on the words being legibly printed we think the purchaser can have very little trouble in securing himself, if he thinks proper to do so. If you ask me to defend the principle, that a man should be liable to have one thing given him when he asks for another, I cannot do so; I can only explain it by saying it is the custom. The Board of Inland

Revenue act under the Treasury; they have the authority of the Treasury, and they can only go as far as the Treasury allows them to go in the matter. The Treasury say, "We allow this mixture, provided you adopt these regulations." The Board have done so. I may say, with regard to chicory, I have no doubt from my own experience, that a very large bulk of the public prefer the mixture; that, however, is a question of taste. The trade contend that good coffee, mixed with one-eighth part of chicory, and sold at a moderate price, makes a better beverage than ordinary coffee would do at the same price, and the great mass of the public prefer it. Chicory sold as coffee yields a certain profit, but probably it equalises itself in the general competition of trade. There is a large quantity of chicory sold by itself, and drunk as a beverage in the neighbourhood of Manchester and Liverpool. I believe the price of a pound of the cheapest kind of coffee purchased by the bulk of the poor people, and a pound of mixture, is about the same. The trade say, where we use a portion of chicory we use a better coffee. I do not know the fact of my own knowledge. We have positive means of judging of the prices paid, as we always have the prices sent up. We have had cases out of the number I have spoken of which were purchased as genuine, but were found to be adulterated. In those cases the price was precisely the same as if you asked for genuine coffee. Whether the coffee sold in mixtures is of a superior quality to that sold as a pure article would be very difficult to ascertain; it depends upon the question of taste and aroma. We have no other proof of the fact than the statement by the trade, that they introduce into the mixtures a superior kind of coffee. The chicory itself is not always pure. I have found the following articles in different samples: beans, rye, oats (roasted and ground), caramel, that is burnt sugar, red oxide of iron, and orange berries; orange berries were used a few years ago, though I have not noticed them lately, in the neighbourhood of Manchester, where chicory was really drunk as a beverage alone. The proportions in which we have found this admixture with chicory are various; in one case at Manchester those substances formed from 50 to 70 per cent. I know this adulterated chicory is mixed with coffee, having had some of the coffee with which it was mixed. I believe this was something lower in point of price. The case I am speaking of occurred some years ago, when chicory was worth more than it is now; it was an object for them then to introduce those substances. We proceeded against those parties and convicted them. There is a profit in selling chicory for coffee, provided they sell it at the same price; but I believe as a rule the price of the mixture is in proportion to the quantity of chicory present, and the value of the coffee used. You may give as much for a pound of coffee which contains 12 per cent. of chicory; in fact, more. You will buy a good deal of coffee mixed at 1s. 6d. a pound, if it is a fine coffee, and you may buy pure coffee at 1s.; though the coffee mixed may contain 12 or 13 per cent. of chicory. The grocers contend that one-eighth is a proper proportion, and I believe that from my own experience. I always drink the mixture, and prefer it. I find nothing injurious to the constitution in it, and I consider it an accommodation and an advantage to the public that the vendors should be allowed to mix chicory with it. I think the price is a matter you must leave to the public; it always regulates itself. It is quite possible that a trader shall sell coffee which costs him 1s. 6d. a pound, and shall put into it one-eighth of chicory, making the mixture cost him a higher price than if he had sold pure coffee at 1s. a pound. I do not think it possible that a man may mix chicory to the extent of one-eighth or one-fourth with common coffee. It is deficient in aroma, and the principle which would disguise the chicory. I think any one possessing any degree of perception in taste would soon notice the thing. I am not now speaking of the very lowest of the people, who would almost drink anything; because what can one imagine more gross than chicory by itself; and yet that was drunk in the neighbourhood of Manchester some time ago; but I think the middle classes would detect the difference. The grocers say that it is very important that the coffee and chicory should be well ground together, and that you cannot so well make it without. The Excise officers are quite as vigilant in detecting this kind of fraud as if the chicory were deleterious; ours is a question of revenue, not of health; sugar is as injurious to us as arsenic when mixed with tobacco. What I here said as to my own taste, and the character of the mixture, has nothing to do with the offence as regards the Excise. Our officers are directed to watch the thing quite as rigidly, notwithstanding the taste of certain members of the Excise. I prefer a mixture of chicory in my coffee, but I always make it for myself. If an ordinary purchaser of coffee is served with a mixture of chicory and coffee, he may get in that mixture a proportion varying from 20 or 50 to 75 per cent. of chicory. We once found 95 per cent. of chicory, but I think that must have been a mistake; I think some coffee must have accidentally fallen in the chicory. I think it was sent out as a mixture; it would have been too gross to have been sold as coffee, though it would have been legal.

The return of *spirits* I find not to be stated. In the cases which came to us it might not be a question of adulteration, but of strength. We can always ascertain when spirits are adulterated. We have abandoned what is termed stock-taking of the retailers. The trade is thrown open, and they are left to do pretty much as they like; at the present moment we have the power to take stock if we think proper; the goods are sent in with a permit, and the trader enters them in a book, and when the officer goes he takes up this document representing the receipt of a certain spirit, and if we think proper we can take the stock. If the public wished to drink gin at 50 per cent. under proof, the retailer could have it sent in to him. The law prohibits him from putting anything to it himself. He is not allowed to add sugar or water to his gin; it is an act of compounding which we do not recognise. The duty is paid on the spirit. Suppose, for instance, the publican buys his gin at 17 under proof, that is, in every 100 gallons of pure spirit 17 gallons of water. That may be too strong for ordinary taste, and therefore the publican, when he gets it in at that strength, reduces it probably. I cannot say he does from actual knowledge, but we may suppose that he does. If you were to interfere with the retailer as regards the reduction of the gin, the retailer must fall back upon the wholesale dealer, and have it ready made up to the strength he requires, sweetened and all. I do not think we should gain anything by that as a question of revenue. Whether a man pays more than he ought to do when he drinks gin and water, ready prepared as gin, is a question which the public will always put right themselves. If they do not like one man's gin they will go to another whose gin they prefer. The term purity I understand to have reference to water only. The public will pay a certain price, and will have a certain article; if the retailer has not that article in a state to deliver to his customers, we will suppose he makes it so; and we will suppose that that is an infringement of the Act of Parliament; but if that were put a stop to it is not a question of revenue; we should derive nothing from it; the retailer must then go back to the wholesale dealer. The public like to drink what is termed neat spirits. I do not think they drink it strong; I should think the average strength of gin is in London from 40 to 50 under proof, and it is purchased from 18 to 20. To compel the retailer to sell it at proof I think would be highly immoral and injurious; I think it is far better for them to drink weak gin and water than strong; I think the question of strength is just the question of price. This will account for the differences of price one sees charged in different shops. There is no doubt that competition in the retail spirit trade, like all others, reduces the profit to a pretty equal amount. I will endeavour to make the difference between spirits and other things as clear as I can. Pepper pays a duty of 6d. per lb. and 5 per cent. I have had cases in which 90 per cent. of foreign matter has been mixed with a sample of pepper. It is clear as a question of revenue we lose considerably upon that. But when you come to spirits we must define what is meant by a mixture. If we go back to absolute alcohol, and trace it down till it comes into the hands of the publican, we shall find that one man drinks his brandy no stronger than the poor man drinks his weak gin; you must therefore define the amount of strength which the retailer is to sell; and I think that would be a great hardship upon the trade; I think it is far better to leave it open to the public to correct all those little differences of opinion. Supposing a man could drink one pint of absolute alcohol in a day, and that is as much as he could manage, it would be poison to him, and he will bring it down to the state in which he can drink it; however you may confine him to any particular strength, if he drinks more than that, it will knock him up. If he drinks any number of glasses of gin of a certain strength, they may contain only as much spirit as he has been used to; if he takes ten glasses of gin, he may take as much spirit in those ten as in double the number. We do not look upon water as an adulteration. We levy the duty on the proof gallon. No man could drink proof spirits. There is no difficulty in arriving at the strength of any spirituous mixture; no matter whether it contains sugar, or whatever you think proper to mix with it, we can give you the exact quantity of the spirit present. I do not think the admixture with water afterwards affects us at all. If a trader reduces his gin with water, and endeavours to make it stronger by putting in something else, that would be adulteration. Mixture with water only is a different matter; it is all gin and water which is sold. The distillers have no standard. You may go to a rectifier, and buy your gin 10 under proof; they sell cordials at that strength, and they are compounded. I think the question of strength and price purely a question between buyer and seller. I think water should not be regarded as an adulteration. The only adulteration I would notice is the admixture of certain articles intended to give a strong flavour to gin, or injurious to health. It is quite possible that some palatable taste may be produced by the introduction of very deleterious matters; that we would consider an adulteration, and we should proceed against the party if we found it out. If we found something foreign to the gin we should have a fair case against the man for adulteration, or the possession of an article for the purpose. A case occurred some few years ago. A gentleman in the north of Scotland, who drank his fourteen or sixteen glasses of toddy in an evening became very ill from drinking it. He would persist in the belief that it contained corrosive sublimate; he sent us up a sample. We examined it, and it was perfectly pure; and we found the whole mischief arose from the quantity and not the quality of the spirit. I am afraid that this is the case with gin. People drink too much, and then complain of the quality of the article. I have heard of cayenne pepper being mixed with gin; it could be detected of course. If I were asked, "What is the strength of the spirit, and what it contains," my analysis would be made to ascertain the strength of the spirit, and the quantity of sugar or colouring matter it contained, and if any deleterious substance was suspected I should endeavour to detect it, but I do not remember a case of the kind. I do not recollect a case of adulteration of spirits during the twelve years I have spoken of. The return I have here does not give the cause why those spirits were not allowed. The heading is, "Total number of samples found to be as stated;" the total number of samples examined was 105; out of that number 73 were found to be as stated and 32 not. I cannot say what is the meaning of "found to be as stated." I do not know what they were sent up for; probably it might be a question of strength.

Brandy, if you view colouring matter as adulteration, is always adulterated; but I cannot speak to the use of other ingredients. I have no knowledge of what a particular trader may do. I cannot tell how foreign wine comes within our province to examine. We have had two samples—one in 1850, and one in 1852. Wine is under the Customs, and the dealers have to pay a licence to us. British wines are made up in a variety of ways: we do not interfere with them much. It is presumed that they shall not produce more than 12 per cent. by fermentation. We get samples to ascertain what is the quantity of spirit in them, and whether it is a cordial or not. With respect to *vinegar*, there is no duty, and we have little or nothing to do with it now. When there was a duty on vinegar, the law allowed a small per centage of sulphuric acid: I am not aware that it was adulterated beyond that.

With respect to *malt*, we have been in some difficulty; but I believe we have now arrived at a means by which we can detect any mixture. It is possible we may have been defrauded of malt duty by the mixture of grain; some traders assert that we have largely, but I cannot say of my own knowledge. The mixture would be chiefly barley, I suppose. *Hops* are charged with duty at the planter's. The return I have given is with respect to hops which have been used in brewing beer; it appears that for six years we never had a sample forwarded. In 1843 and 1844 there were only two sent, which were found to be adulterated; from that period, up to the 30th of October, 1850, we received nine, the whole of which were adulterated; from the 30th of October, 1851, to the 29th of October, 1852, we had eight samples sent, one of which was genuine, and seven were adulterated; from the 30th of October, 1852, to the 29th of October, 1853, we had five samples, all of which were adulterated; from the 30th of October, 1853, to the 29th of October, 1854, we had five samples sent, two of which were genuine, and three adulterated; from the 30th of October, 1854, to the 30th of July, 1855, we had eleven samples sent, two of which were genuine, and nine adulterated. These substances have been found in hops: cocculus indicus, grains of paradise, quassia, chiretta, gentian, camomile flowers, coriander seeds, and, in one instance, exhausted tobacco. The substance we have most generally found is grains of paradise. That is not prejudicial to the consumer; it is mere pepper. Cocculus indicus is a strong poison. I nearly poisoned myself the other day in getting out a sample for a case I had. They say it is used to produce intoxication, but I do not believe it will do so; it does not do so with me. The two substances most objectionable are cocculus indicus and tobacco; it is impossible to say what would be the effect of these taken internally. The use of grains of paradise is this: when a brewer uses a bitter such as quassia, which is the most persistent and cheapest bitter he can use for brewing purposes—if it were used alone in any perceptible quantity, it would dwell on the palate, and any one would know that it was not the bitter of the hop; but if they use quassia and grains of paradise together, the biting property of the grains of paradise on the palate disguises, to a certain extent, the perception of the bitter: we view that as a fraud on the revenue. It is a fraud on the public also. Brewers are subject to penalties for such ingredients being found on their premises, and we have prosecuted many. Our men have power to enter the brewer's premises at any time they think proper; in practice, I think, they visit once a fortnight, and then there is the chance of the supervisor going in also. From five o'clock in the morning to ten o'clock at night he can go in by himself; after those hours he must have a peace-officer with him. He makes a return of what he observes, and the brewer must enter every brewing of malt under a penalty. The officer is enjoined to go there within so many days, and he takes the original entries and makes a transcript of them, and signs this paper; the supervisor does the same; he is the checking officer: he should go independently of the officer, and visit any trader he thinks proper without the knowledge of the officer, and we suppose that he does so. There was a notion some time ago that there was strychnine in pale ale, but I believe there was no foundation for it. I do not think there is a large quantity of strychnine brought into the country. I know when I want any I have frequently to send to Paris for it.

Soap is an article we have now nothing to do with, the whole of the duty being removed. I do not think it was ever much adulterated. There might be common salt and sulphate of soda; some persons would try to increase the weight or volume of the soap; but I do not think, generally speaking, adulteration was largely resorted to. Dr. Normandy had a patent, the object of which was to lower the price, by the introduction of sulphate of soda. I should consider that a lowering of the soap. I have never seen the patent. I do not know whether it would be a fraud upon the public; it would be the same case as that of gin reduced by water. A person who takes out a patent for making soap is obliged to specify what he puts into the soap; and if a person tells the public what an article is made of, it makes a very material difference; in publishing the specification you expose the whole process.

In *tea*, as imported, I have found gum, indigo, a vegetable yellow (I cannot say exactly what it was); Prussian blue, which is rare; carbonate of magnesia, sulphate of lime and silica. In the tea made up in this country, I found re-dried tea-leaves; other leaves—namely, beech, elm, bastard plane, fancy oak, and willow, made up to represent green tea with gum, Dutch pink, Prussian blue, indigo, carbonate of magnesia, French chalk, and sulphate of lime. When dried leaves and re-dried tea has been made up to represent black tea, I have found gum outside the leaf just coated over with rose pink to give it a bloom. Foreign leaves are broken up very small, and sifted through a sieve; they are then gathered up by means of gum water, and rolled into pieces, sometimes to represent the caper tea, sometimes coarse gunpowder; they are then faced over with colouring matter made of the blue and yellow substances I have named; and bloomed, by being put into a bag with a little carbonate of magnesia, French chalk, or sulphate of lime. I have known carbonate of copper in tea, in one instance; in that case the Board, on account of the nature of the adulteration, fined the party £10 for every pound of tea which was found on his premises—amounting to twenty-six or thirty-six pounds. The system of fining is very generally adopted when we find adulterations in tea; but I cannot state the amount which has been derived from that source in any given year. Tea manufactured in this country has been discovered either from information, or the vigilance of our own officers; and we have seized the whole of the materials and the apparatus. The manufacture of this adulterated tea was at one time a trade of itself; but I have no reason to believe it exists at present. There were two cargoes of tea wrecked about the year 1840 or 1841; the Treasury granted permission to the underwriters to make the best use they could of it. A party connected with the tea trade washed it, and re-dried it on a common kiln used for drying malt. This tea found its way into the market at a reduced price. After the cargo was gone, the trade wanted something to lower the price of their tea, and then re-dried tea-leaves were brought up; it became a trade for parties to go round to different hotels, and large houses, and buy them up at 2d. a pound; the re-dried leaves, however, were not sufficient to furnish the quantity required, and then resort was had to British plants. I believe that that manufacture has been entirely suppressed. A patent was taken out some years ago for the manufacture of British tea; but I never saw the tea produced under it. It was not allowed to be continued. The tea was stopped and destroyed at the Excise-office. The tea which I have described as adulterated when imported is small compared with the whole amount brought into the kingdom. This was a quantity of tea grown in the neighbourhood of Canton; it is either black or green according to the demand; in fact, a large proportion of it was really black leaves, but made up to represent green tea. As far as I recollect, a chest of it was seized by one of our officers. The trader said, "It is as I had it from the Docks." I was ordered to analyse this tea, and I found it very grossly adulterated—I think, to the extent of 49 per cent. The Board directed me to go down to the bonded warehouse where this tea was lying, and I examined a great many chests. Gum was the chief portion of the adulteration; they were small fragments glued together by means of gum, and then coloured over. I went to a great number of those packages, and sampled them, and found they agreed with the quantity seized from the trader, and we were obliged to give it up. I do not know what proportion the gunpowder tea, so composed, bears to the whole quantity imported. I have never heard of any other cargo of tea imported which was adulterated to the extent of 49 per cent. I am not quite certain that I am right in that amount. There was some tea, as it was called, introduced into this country from Singapore, but there was not a particle of tea in it. I took samples to Dr. Lindley myself; and though he could not state what leaf it was, it was not a British leaf nor a tea leaf. A large quantity of this article came in, but it could not be sold, and I believe it was shipped to Holland. I have not recently heard of any gross adulterations of tea as imported. The adulteration which exists is the facing of the tea. The proportion of adulteration as regards weight, compared with the whole importation of tea, is very small. It would be difficult to say the exact amount. The matter which is used in the facing is not deleterious to the health of the consumer, if indigo be the blue used; but I think it is a very foolish practice to encourage. Prussian blue would be injurious, and that I have found in the tea as imported from China; it is also one of the adulterations practised in this country. I am not aware that there is any other kind of adulteration of tea except the facings of the green teas. Some of the common caper tea from China is very grossly adulterated; in fact, they are made up in small nodules, and disguised in the manipulation. I do not think, however, much of that tea is introduced. I have found nothing in that spurious caper which is injurious to the public health but Prussian blue, and the glazing matter is merely a superficial coating, so thin that you could not define the thickness of it; the weight, I apprehend, is very small.

With regard to *tobacco,* I gave evidence before the Committee which sat some years ago. Samples were prepared at that time for the Excise, adulterated in particular ways, and afterwards submitted to myself, professor Graham, and the late Sir Richard Phillips. We were not able to detect all the adulterations in those specimens, but we were placed in very difficult circumstances. Mr. Hume was the Chairman of the Committee. We protested against the mode in which we were to undertake the examination; we said it was an unfair test of chemistry to send us samples of tobacco without our having any standard to fall back on, and then to lay our short-comings upon the science; the tobacco might have been adulterated with parts of the tobacco plant itself. Mr. Hume said he could see no use in our having standards, and we were refused them, therefore we undertook the examination under those circumstances and did the best we could. We are now more expert, and we use the microscope more than we did; we have no difficulty in detecting chicory in coffee, and we have great facility in detecting adulterations generally. Within the last few years, we have exercised much more vigilance as regards coffee. With respect to beer, we had at one time to take the declaration of the brewer; we had no means of ascertaining the gravity at which the beer was brewed. Having now arrived at a standard, we are perhaps more active as regards beer. The kind of examination we have of tea is this: an officer, who is supposed to be qualified, goes into the trader's premises, if he suspects anything wrong, and examines the tea; if after he has made the examination he is satisfied that nothing is wrong, he does not even take a sample; if he has a suspicion that something is wrong, which he cannot make out, he takes a sample, and it is forwarded to the Board for examination. There might have been some thousands of samples of tea examined, but only 142 have been sent up in 11¾ years; 65 were found genuine, 67 adulterated.

We have found many adulterations in *snuff*. We recognise certain adulterations in Scotch and rappee snuff; common salt, and what are termed alkaline salts. In Irish and Welsh snuff we allow the use of lime water only. Beyond those substances, we have found in different samples the following: common peat, such as you would get from the bogs of Ireland, starch, ground wood of various kinds, fustic being most predominant, extract of logwood, chromate of lead, bi-chromate of potash, and various ochreous earths. The extent of the chromate of lead would not be great; it might be injurious, but I am not aware that it is. We have also had samples of spurious snuff made up, and variously scented, to represent Scotch, Welsh, and Irish snuff, which has been composed of the following substances: sumach, umber, Spanish brown, and common salt. In another case we found peat, umber, and common salt. In another peat, fustic, and common salt. In another ground coal, peat, and extract of logwood. In another ground peat, yellow ochre, lime, and sand; the whole of them being more or less scented. I have no doubt they were made for the purpose of being mixed with other snuffs. We have had in the whole 11¾ years, 1,036 cases of adulteration. It may be saying too much, to suggest that they represent the number of prosecutions, because there might be two or more samples in one case. We prosecuted in every case. Peat was a very common adulteration at one time. It is not injurious. Fustic we have found to be a common adulteration in Irish snuffs. It is a dye wood; the object of using it is to impart a yellow colour to the snuff. We have not found fustic in large quantities; probably 10 per cent. It has no deleterious effect; it is simply taking wood, instead of tobacco.

With respect to *pepper*, the number of samples was 1,116: 540 were found to be genuine, and 576 adulterated; all being sent up under suspicion. We have found rice, sago, potato starch, linseed meal, chilies, husks of red and white mustard seed, wood, wheat bran and flour, oat flour, and ground gypsum or crystallised sulphate of lime. The stock material for adulterating pepper is the husks of red and white mustard seeds, and linseed meal warmed up with chilies. I should not like to swallow much gypsum. There is nothing very hurtful in the other substances, but they are decidedly not pepper. The question with us is one of duty; we are not a Board of Health, but a Board of Revenue. Chilies are not injurious, but the persons who sell that material for pepper are committing a fraud upon the public. The pepper adulteration is of a kind that we have full power to put down, because it is one which an ordinary officer can readily discover. We have a vast number of officers who are competent to say whether a sample of pepper is adulterated or not. We have had many prosecutions for adulterating pepper. The cases I gave were 576; but they would not represent the number of prosecutions; they would be rather above the number. There was a substance at one time introduced called African pepper. We have found the same substances in that.

With regard to *tobacco*, we have found in cut tobacco, sugar, liquorice, gum, catechu, common salt, saltpetre, and various nitrates; yellow ochre, Epsom salts, Glauber salts, green copperas, red sandstone, wheat, oatmeal, malt combings, chicory, and the following leaves: coltsfoot, rhubarb, chicory, endive, oak, elm; and in fancy tobacco I once found lavender, and a wort called mugwort. It is a fragrant herb, suggestive rather of the nutmeg. In roll tobacco we have found rhubarb, endive, and dock leaves, sugar, liquorice, and a dye made of logwood and sulphate of iron. The adulteration of tobacco at one time was large. The law allowed the adulteration of tobacco for a short period, but the experiment was not very successful as regards the revenue, and it was found necessary to put a stop to it. I do not know upon what principle the adulteration of tobacco was allowed; it was under an Act called Baring's Act; anything was allowed except the leaves of trees, herbs, and plants. But it was never contemplated, when the permission was granted, that the trade would exercise the amount of ingenuity they did. The law thought it was impossible to get the foreign substances in to the extent they did; they got them in to the extent of 70 per cent. At present, water only is allowed for mixing with tobacco, and I believe the tobacco trade to be perfectly free from adulteration. We are not losing 1-8th per cent.

I have had a few other things under my notice. Two or three things have been brought out to mix with coffee. There was a substance a few years ago called *Turkish Aroma*. It was sold as being a great improvement to coffee, when mixed with it. I am not aware that it is in existence now. One sample was found to be roasted peas, chicory, and caramel; another example consisted of a roasted root, which I believe was dandelion and caramel and sugar; a third contained the true chicory, the roasted endive root. I believe they were used only to a small extent, and I do not think they are now in existence. There was another substance called *cafeine*, which was a mixture of roasted grain and ordinary chicory. That was sold as an improvement to coffee. Another substance of the kind, called *bonka*, was beetroot roasted. Beetroot was largely cultivated for chicory, and yields the best chicory. There was one substance imported in 1849, called la veno beno. I examined that, and the following was the analysis: 24 per cent. of sumach leaves, and 76 per cent. of catechu; it was a strong astringent. The first case we had of the use of that was in Glasgow. The Board immediately took measures to put a stop to it, and I believe it had a very short existence. I have heard nothing of it for years.

Cocoa, though it is under us, we have not much to do with. In 1846 there were some complaints to the Board about the adulteration of cocoa, and I was directed to go about and examine the various manufactories in London. I did so, and took samples. It was stated to me that there was a large introduction of earthy matter, but the analysis we took of those samples did not justify that opinion. Our object was merely to get the amount of earthy matter, irrespective of what it might be. The first sample of the nuts when burnt gave 4·1 of ash and 1·4 of salts, earth 2·5 and 2-10ths of sand. The second sample gave 4·9 of ash, 1·3 of salts, 2·7 of earths, and 9-10ths of sand. The third gave 3·1 of ash, 1·1 of salts, 1·9 of earths, and 1-10th of sand. The samples of cocoa yielded as follows: No. 1, 4·0 of ash, 1·2 of salts, 2·5 of earths, and 3-10ths of sand. No. 2, gave only 7-10ths of ash, 4-10ths of salts, 2-10ths of earth, and 1-10th of sand. The third sample gave 4·1 of ash, 1·4 of salts, 2·4 of earths, and 3-10ths of sand. The fifth sample gave 4·0 of ash, 1·4 of salts, 2·2 of earths, and 4-10ths of sand. The sixth gave 4·7 of ash, 1·0 of salts, 3·2 of earths, and 5-10ths of sand. The seventh gave 5·0 of ash, 1·0 of salts, 3·6 of earths, and 4-10ths of sand. The eighth gave 5·1 of ash, 9-10ths of salt, 3·5 of earths, and 5-10ths of sand. The ninth gave 5·1 of ash, 1·0 of salts, 3·4 of earths, and 4-10ths of sand. If the manufactured article had been really all cocoa there is not much to complain of as regards earthy matter, but that is not so, because there was a large per centage of farina or starch present, and a large per centage of sugar. In one case, in fact, where I succeeded in getting proportions from a manufacturer of what he called his best soluble cocoa, there were, in his own language, cocoa 42, lump 42, white and red 56. The cocoa represents the nut, the lump the sugar, and the white is starch, and the red oxide of iron to colour it. The per centage of cocoa in that sample would be 30 per cent., and that was stated by the manufacturer to be his best soluble cocoa. I believe, if we trace back the consumption of cocoa in this country, we shall find, that before it was rendered soluble by admixture with sugar and starch, the consumption was very small; that was the reason the manufacturers adopted the mixture of starch and sugar. There is no ingredient in that analysis which is injurious; oxide of iron, in the small quantity taken there, I should not think was injurious. If cocoa were sold pure, and were not mixed with saccharine and with starch, I believe it would drive cocoa out of consumption. The public can get the nibs, which are pure cocoa, but they will not buy them. There is very little cocoa sold to the public for consumption in the shape of nibs.

In 1851, Dr. Hassall applied to our Board, and asked to be furnished with some analyses of tea and other substances, which we gave him; I believe eleven samples were furnished to him. With regard to pepper, the Committee will see that we were very active in the year 1842; an examination of pepper is purely a microscopical examination. My opinion is that the Excise has at the present moment facilities for detecting adulteration in certain articles of a very considerable kind. No doubt similar means can be applied to protect the public from adulterations; it would, however, require great practice; a mere knowledge of chemistry alone is not sufficient; the great difficulty is to train practical men, who can go into a place and say, This is wrong, and this is right. Pure chemistry would have been quite incompetent to have protected the tobacco duty against loss from adulteration. A man to do that must not only have chemical knowledge, but a practical knowledge of the manufacture and the nature of tobacco; and he must know the various processes, so that when he is in the manufactory he can distinguish one from the other. A practical man can distinguish one from the other. A practical man can determine in a moment whether a sample is genuine or not from his great experience; and I apprehend, in order to carry out anything like that which we are doing, you must have men who have practical experience, who can go in and form a tolerably accurate opinion of what they are seeking after upon the spot. We are educating a special class of persons at the present moment for the purpose of detecting adulterations in articles which come under the Excise Laws. We have no difficulty in finding men to carry out the present improved methods of investigation in our department. They are first sent to the University, and they have either two or three years' education, and they then come to me. I give them all the knowledge I can within a limited period. They are then placed under the guidance of some older and more experienced hands, and they go round and visit different traders, and see the appearance and the characteristics of adulterated articles and genuine articles, and so we endeavour to give them a practical knowledge of that which they have to attend to. With respect to bread and coffee and milk, there would be no difficulty in ascertaining a single case; but when you look at the extent of the consumption of those articles, a difficulty arises how you are to analyse every sample which must be taken. Probably the existence of such an officer would deter people from such practices. I have had the remark made to me by a tobacco manufacturer, What use is it sending such a man as that here? He did not know what he was about; he was a man who had a chemical knowledge, but he had no practical experience; he might have been enabled from his chemical knowledge to have made a satisfactory examination of one sample of tobacco, but the difficulty was, that upon going into the factory he did not know what to do when he was there. The officers must have a knowledge of the various trades. For discovering adulterations in things which the poor consume, such as bread and coffee and milk, I think it would be easy to train a man who should be the inspecting officer of a district. Any individual may acquire the knowledge in time. Tobacco is a very difficult thing to examine, and it is as difficult to detect the adulteration of beer with water as it is to detect foreign substances in tobacco. We cannot tell unless we have the gravity of the beer; give us the original gravity of the beer that it was bought at, and then we can tell what it had been done with afterwards. It would require that there should be laws which made it illegal to sell beer under a certain gravity, or it would be impossible to detect adulteration with water. It is very true, no doubt, that adulteration is practised in beer, but not to the extent which has been generally stated. You would not call it an adulteration if I, as a beer retailer, buying Barclay and Perkins' porter, put into it a weak, low ale, which I buy at half the price; that is well known to be a common practice in the trade. There are a certain class of small brewers who brew light, cheap ales, to be mixed with the porter and stout of the brewers. We must not, therefore, because the publican is buying a beer at 35s. or 36s. per barrel, say that that man is adulterating; he is mixing, but he is mixing what the law permits. Adulterations have diminished, in my opinion, since the chemical inspectors have been appointed by the Excise. I believe they are totally suppressed in the article of tobacco, with which the system commenced. Adulteration no doubt exists, but it does not exist, in my opinion, to an alarming extent. I have no doubt the existence of those men, if they performed their duty, must have a good effect. The apprehension of an examination has, in my opinion, had the effect of diminishing adulteration, and I apprehend the very fact of their existence being known must exercise some effect. I do not think there is any difficulty in putting down any adulteration. The existence of those officers having already diminished adulteration, if the system were extended still further, so that they should examine things which did not pay duty, but which were adulterated, I would expect that adulterations in those articles would be diminished. I will give the Committee a return of the number of traders whom we have to overlook. Of brewers we have 41,446 in the United Kingdom; of beer retailers we have 131,468; of tea, coffee, and pepper dealers we have 142,747; of tobacco dealers we have 236,647; and manufacturers, 571: making a total of dealers and manufacturers of 237,218. My inference is that the cases of adulteration are very few in proportion to the number of traders. I take credit to ourselves that we detect all the adulteration that happens. What would be the effect of extending this species of supervision to all articles which are sold by the various trades of the United Kingdom I can hardly tell. I mean an inspection applying to drapers and silk mercers, and so on. I think that would be unbearable. I would recommend the public to look after themselves. It is my opinion that the public can generally best protect themselves.

Drugs are an exception; and I am not sure that the public could protect themselves against alum. I do not think the amount ordinarily used is injurious to health. If plaster of Paris has been found in bread I think it has been in very exceptional cases. I never heard of its occurring in bread. I have read some of Dr. Hassall's evidence, but I do not agree in his conclusions with regard to the extensive adulteration of the necessaries of life. I think it is a great exaggeration; I do not think myself that it is true. I have had a large experience in several of the necessaries of life, which I have stated, and on that experience I formed my opinion. I compare those articles with other articles, and it is only a fair inference to suppose that other articles are pretty much the same as those which have been examined. One result of the very extended examination I have spoken to is that I do not think there is any reason to believe that adulteration does exist to the extent which has been stated. My ground for saying that Dr. Hassall has exaggerated is my own experiments. If I understand his statement aright, he examined beer by means of acetate of lead. I think it was so stated in the *Times*, but I refer to it under a doubt. If Dr. Hassall examined samples of beer with acetate of lead, and judged of them from that, it was a most fallacious conclusion to arrive at, to suppose that the beer was adulterated, because a precipitate was caused by adding acetate of lead to the beer. If you add acetate of lead to any beer which was ever brewed, or will be brewed, you will have a precipitate. My own experience as to beer I think has been greater than Dr. Hassall's. I judge by the number of the experiments he has stated. Out of the large number of samples of beer I have mentioned, there was no reason to believe that more than 12 per cent. were adulterated. I think my evidence has gone through some of the principal articles of consumption, with the exception of drugs, in this country. Consequently it is fair to presume, having had samples sent up to me by the vigilance of 4,000 officers, for inspection, that my experience is at least equal to that of Dr. Hassall. I have been analytical chemist to the Board of Inland Revenue thirteen years. Dr. Hassall purchased samples of the goods which he analysed as a common buyer. My samples were sent up as suspected; many that I have given you here were samples seized by people who were perfectly competent to determine on the spot what they were about. I read the evidence which was given before the Committee of this House on the subject of tobacco a few years ago. There was some very strange evidence given there. There were the names of manufacturers whose names were not published, because they disclosed the practices of the trade, but that was not as regards adulteration; that was as regards smuggling. I am aware that one manufacturer gave a list of 23 articles with which tobacco was mixed or adulterated, some to give it flavour, and some to give it weight. The question before that Committee was the question of the duty. It was understood to show that we were incompetent to protect the revenue; we maintained that we were, and were very severely tested. The result of my opinion is that the revenue is now entirely protected in reference to the article of tobacco. My samples of beer were taken from the brewery, and my evidence applies to the quality of the beer as sold by the brewer, not as sold by the publican.

EVIDENCE OF ALPHONSE NORMANDY, M.D.

A QUESTION was put to the last witness with regard to a patent of mine for the manufacture of soap. I am anxious to give some information which the honourable Member was evidently anxious to obtain. I have taken out a patent for the introduction of a certain quantity of sulphate of soda into soap for the following purpose. Soap is made of materials which are known in the trade as "goods," and as "weak goods." The materials which are known as weak goods are kitchen stuff, bone fat, and resin; resin being the weakest of all. These substances are so called because the soap produced with them is exceedingly soft or tender; it will scarcely support its own weight. If resin be made into soap, you obtain a soap which is as soft as treacle. This is owing to the soap being a deliquescent salt, which has the property of absorbing moisture from the air, and it becomes in fact dissolved into that water. If such soap be put into an oven, and the water be expelled by the heat of that oven, the soap withdrawn from the oven will be quite hard, but if left exposed to the air for a couple of hours or more, according to the weakness of the goods employed, it would become as soft as treacle again. Knowing that the weakness or tenderness of soap was due to its property of absorbing water, I thought that if I introduced into soap made of such weak materials a salt which, like sulphate of soda, has the property of absorbing water, to become solid, that is to say, to crystallise, I should introduce into such soap an antagonistic element, which would attract to itself, to become solid, the water which the soap would absorb to become liquid, and I found that the introduction of a certain quantity, 5 per cent., for instance, of sulphate of soda, was quite sufficient for the purpose. I have on the subject the highly favourable reports of Professor Miller, of King's College, Dr. Hoffman, Professor of Chemistry at the Museum of Practical Geology, Professor Redwood, who has given evidence before the Committee, and Dr. Stenhouse, Professor of Chemistry at Bartholomew's Hospital, and it has been satisfactorily established before the Privy Council the other day, when I applied for an extension of my patent, that the process was a valuable one, and that it had merit in it, and they granted me an extension. The mixture of sulphate of soda with soap has proved of great advantage in the manufacture of weak soap, and I do not call that an adulteration. I call adulteration the introduction into an article of a substance which confers no quality whatever. Soap which is mixed with sulphate of soda is known in the trade and sold under the name of sulphated soap; therefore, that is no adulteration as I conceive. It is well, also, that I should say that it is a practice with the Privy Council, I believe, never to grant an extension for a patent unless it is proved to their satisfaction that there is considerable merit in the invention; in fact, that is the language of the Act; it must be of great public utility, and possessing considerable merit. Selling soap which has in it 15 or 20 per cent. of sulphate of soda as pure soap would be a fraud. The soap for which I have a patent is invariably sold as sulphated soap, and it is impossible to sell it otherwise, for its appearance is quite distinct from that of other soap.

WEDNESDAY, August 8th, 1855.

EVIDENCE OF RICHARD ARCHER WALLINGTON, Esq.

I am a solicitor, resident at Leamington, and Chairman of the Local Board of Health there. I have taken a great deal of interest in sanitary matters, and questions affecting the health of the people, and that, I presume, led me to the office which I have been appointed to. I have had under my consideration the present position of the law with respect to the subject now under the consideration of the Committee, and the remedies which in my opinion would be best adapted to meet the existing difficulties. I agree with the statements of Mr. Redwood and Mr. Phillips, that the amount of adulteration existing has been very much exaggerated; I entirely concur in that, and I think it is only due to traders to say, that I think they have not always been dealt fairly with, so far as the tests upon which some of the evidence has proceeded are concerned. I form my opinions from facts which have been published, and from the evidence which has been given before the Committee; I have distinct facts on which I frame my opinion, in confirmation of the views of Mr. Redwood and Mr. Phillips. Although it is not necessary for the remedies I propose to make any distinction between adulterations which are innocuous and adulterations which are what I should term beneficial; still, taking a general view of the question, I should wish to draw a distinction of that kind. I wish it to be understood that my plan would work just in the same manner whether there were no adulterations, or whether they were of tenfold the extent which they are now represented to be. I mean that certain restrictions would be very beneficial to the trader, and also to the consumer, irrespective of any assumed adulterations; that is, supposing, on the one hand, adulteration had never taken place, or on the other, that the adulterations had been tenfold, the same remedy would apply. I therefore distinguish between what I should term innocuous admixtures and injurious adulterations. I wish to show particularly that the former may be beneficial, and ought to be encouraged, particularly as they tend to reduce the price of the article. In illustration of that view I will draw the attention of the Committee to the substitution of articles; that is, as it appears to me, the very incentive to competition.

You may have a foreign product which has been sold immemorially under any specified name; and you may have another article of home manufacture, or of home production, which, although not identically the same thing, may be beneficially substituted for the article which may have before been sold under the name known in the trade. Supposing a man having purchased a pound of coffee, goes into another shop, asking for the same article, and gets 75 per cent. of chicory, that is one of the innocent adulterations of which I speak as being the result of competition; and for this reason, there is no standard of the value of any article; there is nothing to represent the fact that any article shall be sold for a certain price. There is no understanding between the public and the seller that the seller shall give you what you ask for; neither do I think it beneficial that it should be so. The same machinery which fixes the price of the one article fixes the price of the other; and you cannot draw a distinction, nor show any reason why competition should not regulate the price of a mixture of coffee and chicory, just as it does the price of coffee alone or any other article. If A adulterates with 75 per cent. of chicory, there is no reason why B should not adulterate with the same extent of chicory, and, therefore, they would be perfectly in competition with each other. If the article were sold at an improper price, it would regulate itself, and that is the only means by which it can do so; otherwise you would take from coffee every substance which has operated to bring down its price; you would leave the article of coffee almost a monopoly, and it might have the effect of taking chicory, which is certainly liked by many people, out of the market altogether; for I suppose chicory could not be sold alone. I think the Treasury Minute with respect to chicory is very good; I think it works beneficially. The same argument applies to every article.

Adding innocuous adulterating substances to other articles with a view to reduce their price is what I entirely justify. I think the reduced price of the article itself would lead to an increase of the general consumption; that is, supposing chicory had never been introduced into this country at all, I believe you would not have had coffee now at anything like the price it is sold for; if coffee had not had to contend with the competition of chicory, I believe that coffee would be a much dearer article to the public than it is. I proceed upon this assumption, that you are endeavouring to sell an article for 1s. which is only worth 3d., or in that proportion. I say that if such a state of things did exist, it would right itself in a month in the ordinary course of competition in trade. There are as many chicory dealers in this country as there are coffee dealers, who would be quite as alive to the adulteration of chicory as any other article. I cannot admit competition in one article and deny it in another article, when there is nothing to make it an exceptional case. I think it is justifiable to mix any foreign substance with an article which is about to be sold, and sell the mixture at the same price at which you would sell the genuine article, provided the trade can get that price; but I do not believe that they can obtain an excessive price for any article. I think the public are sufficiently protected by competition. Competition does not enable the public to know that an article is adulterated; neither do I think it necessary that it should. I think it is sufficient for the public if they get the article, whatever it is, at the cheapest price. "What the eye never sees, the heart never grieves for," is the rule which I should adopt in reference to that. I admit theoretically the public ought to have that which they require, but I think practically it would be impossible to work it out, and if you did work it out it would be a great injury to the public. Competition leads to a reduction in the price of every article produced and sold, except those articles with respect to which competition has not its ordinary play, namely, articles which are sold under any monopoly. Now, in whatever state you get competition, and surely you get it in the articles which have been already mentioned to the fullest extent, the same thing which reduces the price of one article reduces the price of another unless it is exceptional. If you could destroy the competition, instead of working a benefit to the public, you would be working the greatest injury, because you would be creating a whole host of small monopolies in genuine articles, which would so increase the price that it would place them beyond the reach of one-third of the population. I think there are various views to be taken of competition; it acts in various ways. It is impossible to define its working in all its bearings. There is a wheel within a wheel in the very network of competition; you do not know how it acts; but certain it is that it acts, as far as one can see, beneficially to the public. What I say is this, that you may very easily interfere with the machinery, and put it out of gear by preventing competition under its natural circumstances being carried on, but you would have very great difficulty in restoring the trade to the same state in which it is at the present time; it is now worked, and has been working great benefit to the public. I would prevent anything that is noxious and injurious to health, most rigidly; I would even as a mere matter of name concede that anything which is fraudulent to the public pocket should be prohibited, and I have included that also; not that I think it possible that a fraud upon the public pocket can arise, because I return to my original view, namely, competition. I fear that some of the suggestions which have been given to the Committee would interfere with a vast variety of articles which not only assist trade, but to a very great extent are the means by which competition is sustained, and the consumer procures his articles at the low price at which he does obtain them. There is nothing in a name; he procures an article which answers, according to my belief, the purposes for which the public require it, or they would not use it. The sale of sloe leaves under the name of tea, I think can be usefully prevented; it would be desirable to prevent it. I do not admit that sloe leaves mixed with tea should be classed with articles that would assist in competition; I assume that to be a fraud.

It has been my aim and object to keep clear, in suggesting a remedy, of any definition. I think you have such innumerable difficulties in the definition of adulteration, and in dealing with it by legislation, that my remedy renders unnecessary any definitions at the present time. My purpose is to prevent whatever may be deemed hereafter to come under the category either of adulterations injurious to the public health, or adulterations which are fraudulent to the public pocket. I should deny the fact that fraud upon the public pocket exists to any extent worthy of the consideration of the Legislature; but I think it would be advantageous, even though there may be no fraud at the present time, to institute what I would call a remedy which would do no harm if it does no good; it would do no injury though the fraud did not exist. I have no experience of my own to speak from, further than what is already before the Committee, from the evidence of some gentlemen who have had greater experience, perhaps, than any one else in the country. I particularly refer to the evidence of Professor Redwood upon the subject of drugs. I only derive my experience from what knowledge I have of the trade. I believe it is not the interest of either the producer or the seller to produce or sell, as a general rule, adulterated articles. I have been connected with a patent, which was taken out some time ago by my brother-in-law, which has given me a greater knowledge of trade than perhaps other people in my position would have. It was a substitution for isinglass; that gave me a knowledge of the very article I was about to speak on, namely, *gelatine*. In that case we had to meet with all the difficulties which could be raised in the trade, and that brought me into a knowledge of everything connected with the sale of an article under a substituted name. The patented article was always sold under the name which was given in the patent, namely, Patent Refined Isinglass. The patent had two objects: the refining of isinglass, and also the refining of gelatine. From both it produced what has been admitted by every professor in the country almost (because it has been the subject of litigation to an enormous extent) to be an article superior in every respect to the foreign article, and having all the constituent elements of it. My experience refers to the difficulties of substituting an article for one which is already in demand, the substituted article bearing the name of the other article. I believe, if an article is substituted in a trade which has advantages over one already in existence, there is at the present time no difficulty in effecting a sale of that article; but if, on the contrary, an article which is inferior is substituted, I believe it would be totally fallacious, and perfectly impossible, to carry it out to any extent. The patent is now in existence; it has supported about seventy men; it has produced a home consumption in place of the foreign article; it has stood the test of two trials at law, and it has reduced the price of the foreign article to a very extraordinary extent.

Isinglass ought not to contain anything but pure gelatine; in point of fact, isinglass was gelatine in the purest state then known; that is, the bladder of a fish: gelatine, it has been found, could be manufactured still purer and still stronger than that. Before that article was introduced, an article of a very impure quality was introduced under the name of gelatine, which it would have been impossible for any person to sell as isinglass. That, therefore, is a case in which an article may be beneficially introduced under a substituted name. If you get the gelatine pure there would not be so much difference in the price; there is bad isinglass as well as gelatine. There is a bad description of isinglass which is ten times more filthy than the worst description of gelatine, because, looking at the groundwork of it—namely, fish—if it is not pure, it is more impure than any gelatine could be. The worst description of isinglass has been referred to as genuine, and may be genuine, but it is genuinely bad, and it is worse than the worst description of gelatine. The term "gelatine" did not stand well till the invention to which I refer had brought it to the perfection to which it is now brought. You could not have obtained Russian isinglass at the present time under any circumstances at its usual price; there is a limited supply, and you would have had to give a price for it one-third in excess of the present price; therefore, when all the authorities I can give you show the advantage of this article as a superior thing, it is a question whether you should not admit it to be sold in the freest possible way. The name isinglass, in itself, represents nothing; it is merely an article sold which is taken from the bladder of a fish, which contains gelatine, which is denominated isinglass; and any person in the nineteenth century has as much right to take the same gelatine, which is equally pure, and even better in all respects, and call it isinglass, as a person in the thirteenth century had to take a fish's bladder, and, for some reason or other, give it the name of isinglass. If you prevent that class of dealing, namely, the substitution of articles, you strike a blow immediately at trade and at competition, which is the nucleus of trade. I put this forward as an instance of my views, that you ought to allow pure and superior articles to be sold under a substituted name, because they assist in competition. Gold is an exceptional article, and has always been so. Gold represents a standard value, and you cannot interfere with that standard value without materially interfering with other interests of the country. Coffee does not represent a standard value. If you have pure gold, you know the standard value which has been affixed to it. There is a wide difference between what might be termed the standard value of coffee and the standard value of gold. There is good coffee and bad coffee; it differs in degree as to price and value. If you had coffee of equal value, and you could regulate the price of that coffee, and wished to do so, you would have this state of things: you would have a state of things fixed and certain; but the very nature of coffee and other articles is uncertain and indefinite.

The best article that could be produced in gelatine before our invention was nothing but glue. Before our invention, gelatine was sold as gelatine, because they could not get a better name for it. Our principle for calling a thing by the name of another thing which is in considerable demand would not apply till we had purified the substituted article to such an extent that it is really useful to the public. The inventor starts by calling it by the name of that which it most nearly resembles; it would be a perfect fallacy for him to call the inferior article by the name of gelatine. If those two articles were exposed, the inferior one would not sell; that introduces the impossibility of legislating in matters of this kind; you must sell an article by the name of that which it most nearly resembles: that very much affects the question whether you are to support the ingenuity and industry of the country. It has been stated that gelatine is the result of boiling the tissues, whereas isinglass is the natural tissue which has undergone no boiling. I can state, most unquestionably, that that is not so. Professor Brande wrote upon gelatine, and described that as the product. The moment this invention came out, and Professor Brande saw it, he said, "I know we are wrong; I know the theory of all chemists is wrong: gelatine is an educt, and is not a product." This is the opinion of Professor Brande, Professor Taylor, and also of Mr. Cooper and Mr. Phillips, who are dead, and I believe Liebig has recorded the same opinion. If a specimen of our refined gelatine and of Russian isinglass were submitted to a chemist, and he were to analyse them, the results would be in favour of our article. The elementary substances of our refined gelatine are precisely identical with the elementary substances of isinglass, less the impurity which the Russian isinglass has, which ours has not. In point of fact, those specimens have been submitted to a competent analyst twenty times. Both are gelatine. Gelatine is an elementary substance. Russian isinglass ought to be nothing else: it is pure gelatine and something besides; but it was the purest state of gelatine known before this discovery. Now they have separated the gelatine and produced a purer product; but, in fact, the two names are synonymous. Isinglass ought to contain nothing but gelatine. I take a fish's bladder, purify it, and take every insoluble property out of it; I reduce its weight, and am to that extent a loser: having purified that, I am as much authorised to call it isinglass as it was before it was purified. The same principle applies to a thousand things which are not brought before the Committee. Therefore it would be legislating upon a matter when half the substances to which it applies have not come under your knowledge at all. The danger I anticipate is the destroying competition between the foreign product and the home production, when the home production is rendered by ingenuity superior to the foreign article.

In order to elucidate my principle, I would say, that the first difficulty you are under is to define the term "adulteration" in an Act of Parliament, so that the Executive shall know what the term means. I submit that the term is perfectly inapplicable. It is so extensive and undefinable that it is impossible to bring it to any degree of certainty upon which you could safely proceed. In order to get rid of that difficulty, I propose to give powers to the Treasury, or to the Board of Trade, or any official department, from time to time to prohibit the sale, use, manufacture, or importation of articles coming under the categories, or which in their opinion do so, of injurious adulterations or frauds upon the public. I name the Government as the parties to do that, because you would then always have a responsible body, and they can from time to time, as circumstances require it, call to their assistance the best information for the time being. If you appoint a Board of Examiners or a Commission, they may be very able to give opinions to-day, and unable to do so to-morrow. They may upon some subjects have sufficient information, and upon other subjects they may be entirely at a loss. By the means I suggest you would get an elasticity which would enable the Government to work with the times and with the subject which would have to be brought before them; by that means you can determine from time to time what you will prohibit, and what you will think unworthy of being prohibited. Having that Treasury Minute, or that Minute from the Government, that such things should be prohibited, the next thing will be to ascertain how you can select them particularly, and how you can prevent them. The means which have been hitherto suggested have been the appointment of inspectors, and I will draw the attention of the Committee to the disadvantages of inspectorship. I propose to refer to the plan suggested by Dr. Hassall: there we entirely disagree. Dr. Hassall must consider, in his view of the remedy he suggests, that it is the interest of the trade to manufacture and sell, and to import, adulterated articles; he must proceed upon that basis, otherwise the inspectorship would not be necessary. Now I entirely and wholly deny that theory. I say it is wrong and unsound; and I arrive at that conclusion in this way: you have hitherto never imposed any restriction except that of the Excise for a particular object upon manufacturers, importers, or sellers; you have allowed them to sell what they please; therefore if the trade has got into an unhealthy state, I do not say that there ought not to be a sufficient restriction and protection. No doubt you ought to protect the fair trader and the manufacturer in the manufacture of genuine articles, or articles which, for the purpose of definition, are genuine; if you protect the seller, it is the interest of both to manufacture and to sell genuine articles, and if you once enact a law the trader will protect himself; you will get a much better inspectorship through the trade than you can devise by any other means. I will instance pickles. The Government think it undesirable that pickles should be adulterated with colouring matter, and they order that it shall not be done; it then becomes not the interest of the trader to manufacture them. It may be that the public taste may continue, that they would prefer colouring matter; but the trader says, "I am not allowed to do that, and I will prevent any one else doing it." Messrs. Crosse and Blackwell, for instance, have determined not to colour their pickles; their pickles go throughout the country; they have three or four travellers; their directions to them would be naturally these: "If you see pickles which are coloured, let us know of it, and we will prevent it; we will not be competed with by such articles." Therefore the matter will work its own cure. If you once adopt the remedy of prohibiting what you wish to prevent, the trade and the public are naturally the parties to prevent the producer being competed with by adulterated articles. It is the interest of the traders to protect themselves, and I refer to Mr. Redwood's evidence as to the formation of the Pharmaceutical Society to protect the drug trade. I can also refer the Committee to the evidence taken before the Committee of the House of Commons with reference to the beer trade; Mr. Hanbury was examined; he said that the brewers did all in their power to prevent adulteration, and he did not believe that to any extent there was adulteration. I have ascertained it to be the fact that a great many brewers have the power whenever they please to enter any cellars of publicans whom they serve. I quote this to show that it is the interest of all trades to protect themselves as far as they can. The same thing would apply to every other article which is manufactured; where one person is prohibited from doing a certain thing, or will not from conscience do it, he will prevent other persons doing it, if he has the means of preventing it.

I would detect frauds in the same way that you establish every fact which is now required to be established; and here I must remind the Committee that the means have been simplified recently by the Common Law Procedure Act, and by the county courts. As far as chemical analysis or the use of the microscope goes, they will be extremely useful to assist the Government in determining what shall be used and what shall not; but as a means of determining facts, in the numerous instances which would occur both in town and country, they would be perfectly inapplicable. The means I would suggest would be to permit interrogatories to be filed, as against any person selling articles prohibited, and he must answer upon oath any questions put to him through interrogatories. I would not allow interrogatories to be filed till a *primâ facie* case of adulteration has been established; and I would, in the first instance, instead of having recourse to an inspector or an informer, see whether the trade would not work its own remedy. My belief is that there would be an ample number of people to file interrogatories, and put the machinery in force. For instance, the Board of Excise, according to the evidence of Mr. Phillips, have actually put a stop to or crushed various adulterations, and they no longer exist. Precisely the same thing would happen if you give the means of prohibition and prevention. Every man interested in the manufacture or sale of a pure article will himself put the law in force as against his competitor selling an impure and adulterated article. If it did not, then you might have recourse to the Excise as a body, or to informers. The Treasury would issue their minute prohibiting the use of certain articles that would be gazetted, and in that particular way it might be acted upon. We must start upon this basis; every article has its use; you cannot in an Act of Parliament legislate that such an article must not be sold, because in ninety-nine cases out of one hundred you would be legislating against the use of an article, whereas you only want to legislate upon the abuse of it. I do not propose that any public officer should make inquiry, and institute proceedings, as is the case with the Excise. It should be the duty of the Government to make such inquiries as may be necessary, and for them to rescind, vary, or alter their minutes as circumstances may require; it would compel the Government, in the first instance, by their Treasury minute, to determine what articles should not be allowed. I do not think you would have to create any new officer at all; I think it might be attached to the Patent-office, or any office which could take the ordinary duties of a registrar. If there is any in existence, it would not be necessary to create one; all that would be required would be to register merely as a machine; the Government having decided what they would prohibit, it should be the duty of the registrar, upon a sufficient case being made, to direct interrogatories against the person. If you prohibit the sale of a mixture of coffee and chicory under any circumstances, there are quite sufficient persons in the coffee interest to prevent any parties selling coffee and chicory mixed. I think the coffee interest is sufficiently protected. I believe that adulteration with chicory, in the case of coffee which is sold as pure, is of very rare occurrence. I am guided in that belief by the evidence of Mr. Phillips, and that strengthens my opinion, that every article would work in the same way. For instance, I am perfectly satisfied, with reference to the patent refined isinglass, if you were to prohibit that, the persons interested in Russian isinglass would in one moment put the law in force. If any person were to introduce an article which was injurious to any other person's trade, and the law prohibited it, he would be the best person to protect himself and the public. Having determined what should be prohibited, and having directed interrogatories through the means of the registrar, the person must either confess or traverse. In answering upon oath, he must either admit his guilt or maintain his innocence. In such a case, it would be unsafe for him to deny the truth, because there are his men; there I would give the very strongest powers. If you have a *primâ facie* case for instituting the interrogatories, I would follow that up by giving power to the officer to inspect the premises, to inspect the books, and to examine witnesses. You must then bring it into a matter of issue between the parties; you must by that means get at the fact of guilt or denial. If it is admitted, which I have no doubt in ninety-nine cases out of one hundred, if it existed to any extent, it would be, I would then proceed by an injunction prohibiting it. If he should do it again he would be subject to contempt of court; and I think you would find that a much more effectual remedy than information or exposure. If it is not denied, I would then have an issue directed by the county court, and let it be tried by a jury. Supposing the party is found guilty, the injunction would proceed in the same way. I will give you an instance of the fallacy of relying upon exposure; you would have everybody exposed once, and then the remedy is gone; no one cares anything about it beyond that. The *Lancet* took up the question of isinglass and gelatine; not one of the shops cared about it. They said, "We know we are selling purer articles than any one else." I advised my relative to go to considerable expense in getting the result of Dr. Taylor's opinion upon it. The report, however, was never sent out, and that was the reason no one cared anything about it. I would not look upon it as a punishment. If a person went on selling the adulterated article, it would be looked upon as a contempt of court. You may have people paying fines over and over again, and they would continually recur to the same thing. It answers their purpose to do it; but among all the injunctions which have been issued by the courts, you have rarely heard of an instance in which they have been disobeyed. I do not think you would sufficiently protect the producer of an article by any other means. The injunction is to tell a man not to sell those adulterated articles any more. If he is found to do it, he is in contempt. The ordinary course is to imprison a man under those circumstances, and he can only get out of prison by going to the county court, and giving it a sufficient satisfaction that he will not do so again. Supposing a person is now infringing a patent or doing any act injurious to his neighbour sufficient for the interference of the court, the court has the power of issuing an injunction to take care that its orders are supported. The same machinery that set the law in force in the first instance will keep its eye upon him in the second. My objections to inspectors are these: it is such an expensive machinery, irrespective of its objectionable nature to the trade of the country. The trade would say it would be intolerable to have an inspector continually looking after them. I will undertake to say, and I have had some experience with scientific men, you will not get two men to agree upon the same subject; you would get into such a labyrinth of difficulty in carrying out the machinery that it would be impossible to work it.

There should be no examination by way of analysis, except in the way of assisting the Government as to what they should prohibit; and for assisting the parties in extreme cases when they cannot ascertain the fact in any other way. The mode of determining the question scientifically by analysis or by the microscope is the most satisfactory that can be adopted; but it is better to ascertain the fact by other means, and use them as the last resort. Supposing the trader is asked whether such adulterations are in the articles he sells, and supposing his men are asked, and they both deny it, you may put this question to him: "From whom did you have the article?" Dr. Hassall cannot distinguish between a gelatine produced from a fish, and pure gelatine produced in any other way. That still further shows the absurdity of relying upon the microscope or upon analysis; the very test which Dr. Hassall gives for his reasoning upon isinglass, Dr. Taylor, who is an equal authority, wholly denies and repudiates. I think the trade generally throughout this country would greatly prefer the protection which would be given to the fair trader by my plan than by the other. I think the whole thing would work its own cure without any inquisitorial machinery at all; the trade would very much sooner have interrogatories put to themselves than be subject to the continual annoyance of inspectors over whom they have no control. I should not call my remedy inquisitorial; I say that no interrogatories should be established against a person unless a *primâ facie* case had been made out. It is not what we should view as crimination; it is what you would be entitled to ask of a person now in the case of an infringement of a patent. You are not enacting anything which has not been done before. I do not think the system would lead to a great deal of perjury. It was supposed when the law was altered, allowing a person to be examined in his own case, that it would increase perjury, and I believe many of the judges entertained the same opinion. I think that opinion has changed; the same objection does not now apply as when it first came into operation. I do not think it would be carrying the law further than it now exists. You have clearly the power to put interrogatories in some other matters, which would lead to precisely the same result. If it were proved against a person that he was infringing another man's patent, an injunction would issue, and you would have power to ask that man such a question. I do not think you need interrogate the trader at all as to his price or his profits; the question would be one of adulteration, and not of price. Mr. Phillips gave you a very strong illustration of the nature of the duty required of inspectors, and pointed out the difficulty in obtaining men sufficiently qualified. He said you would want a man not only thoroughly versed in the theory of chemistry, but you must have a practical man. In that way it is I say you can never get a man with sufficient practical knowledge combined with sufficient scientific knowledge.

I do not think the case of weights and measures is analogous, for this reason: weights and measures are detected by the fact of their being on the counter or in the possession of the individuals, and in all probability you find two sets of weights and measures. In articles of food the prevention will not so much lie with the retail dealer as the manufacturer; it is the manufacturer you want to discourage; it is through him the Excise now work; they could not, with their small staff, at all compete with adulterations and prevent the substitution of articles injurious to the Excise, except they attacked the practice at its root, namely, the manufacturer. The detection of false weights and measures, and conviction for the use of them, being much easier than the detection of adulteration and conviction for adulteration, I am of opinion that, though in the case of weights and measures the public require extraneous protection beyond that afforded them by the interest of the honest trader, they would not require extraneous protection in the case of adulteration. I think the two cases are very different. It is easy for any person of ordinary talent and knowledge to find out whether weights and measures are false or not; it would be very difficult to get any staff of officers with sufficient information to ascertain, from the use of the microscope or chemical analysis, the condition of all the articles you might put before them. There is one point which Professor Redwood spoke to, namely, the adulteration of gin; the adulteration of gin and spirits was under the consideration of a Committee of the House of Commons some time ago; a great deal of evidence was taken upon the question of the adulteration of spirits, as sold to the consumer; I know that the weight of evidence, and, I believe, the Report of the Committee, in almost precisely the same state of things which now exists, was against any interference with the adulteration of spirits; it is an important thing that a witness here should be confirmed by what took place before another Committee.

I observe, on looking over my notes, that there is a point to which I should particularly wish to draw the attention of the Committee. My plan does not in any way interfere with your afterwards legislating in special cases; and I anticipate that there would be some points which you would have specially to legislate on. For instance, with regard to important articles of confectionery, and anything which the general remedies would not meet, special remedies might be devised to meet. You would start with a general principle, and you would put a stop to the great adulterations by what I may term the general law, leaving other cases to be specially provided for.

FURTHER EVIDENCE OF JOHN POSTGATE, Esq.

I HAVE four samples sent to me from Wolverhampton by Mr. Alfred Hill Brown, a solicitor of that place. They consist of two samples of *bread* and two samples of *flour*; in each I find alum more or less. A sample of *tea* was sent a short time ago from the same town, which contained beech leaves and catechu. The tea itself had evidently been divided, and there was not an entire leaf in the sample. The article of *mustard* has been alluded to. In working this movement I have sometimes curious applications made to me. A person made an application to me some months ago respecting the establishment of a mustard manufactory in Birmingham. He stated that the difficulties in the way of establishing the sale of genuine mustard were so great that he was afraid to establish his manufactory. The question put to me was this: "Would I advise him to begin to manufacture genuine mustard, or to manufacture the adulterated article like the rest of the manufacturers?" Of course, my advice to him was to conduct his business in an honest way, and to meet the difficulties as best he could. I offered my aid to him to see the medical men in Birmingham, and to endeavour to secure a sale for his mustard among the profession. The pure article has a very different appearance from the adulterated article. The pure article has a dead yellow appearance. The article adulterated with turmeric has a bright appearance. This gentleman states in his communication to me, that the adulterated mustard is sold at 4d. a pound to the retailers, and he could not supply the genuine article at that price, but he could sell the genuine mustard to the public for the same price as the adulterated article is sold at by the retailers. Adulterated mustard is sold to the retailer for 4d. a pound, and to the public at 1s. 4d. a pound. He could sell the genuine article to the retailer, but not at the price now paid by him, though it could be retailed, allowing a profit to himself, at the same price as the other. He has not established the business at all in consequence of the difficulties he thought he should have to meet in establishing his business; I advised him to advertise his commodity, and to see the medical men, and endeavour to get a sale for it. He failed in doing that. Mustard is not only a condiment, but it is exceedingly valuable in medicine; we use it in cases of convulsions, and cases of apoplexy, and cases of severe disorder of the stomach, and I have often been greatly disappointed by the action of mustard poultices through the adulteration of the mustard. It has been given in evidence that there is a conventional standard of mustard, and that therefore no medical man is deceived with respect to the strength of a mustard poultice; I do not agree with that opinion. I believe that mustard does differ in its effects and strength very materially, and that therefore a medical man administering an emetic, or prescribing a poultice, would be very dubious as to the effect which either might have. These things occur daily to persons engaged in medical practice. I have advised the application of poultices to the calves of the legs in cases of apoplexy, and they have remained, applied for hours, without reddening the skin. In cases of convulsions in children, the application of a mustard poultice is very useful. It is also a very good emetic, but the action of cayenne pepper, which is generally present in mustard, is very different from the action of mustard itself. One has an action on the bowels as well as being a stimulant to the stomach. I have found in specimens I have tested that large quantities of flour and turmeric were present. The strength of the mustard is reduced by the flour, and with that the strength of the natural yellow colour. That is restored by the turmeric, which gives to mustard a bright yellow colour. Now the mixture of the two seeds, the black and yellow mustard seed, has a dead yellow appearance; and therefore difficulty arises in persuading the public that the dead yellow mustard is the genuine article, and the other adulterated. I have no doubt the adulteration is for the purpose of deception, to enable the manufacturer of mustard to add a certain substance of inferior value to the mustard, and so increase his profit. I do not think it is for the purpose of meeting any general taste as to mustard. I do not know that turmeric is injurious; it is a re-agent for the detection of acids and alkalies. I do not think there is anything in it to be advantageous to the consumer. In *cayenne pepper* I have detected red lead in three samples; the chairman transmitted to me a letter, giving an account of a case in which the consumption of cayenne pepper had produced poison, and the individual is now suffering in London in consequence of the reception of lead into his system in that way: the medical men in attendance upon him at University College Hospital were not aware of the nature of his disease till the question was put to him, whether he had been engaged in any lead works, or had introduced lead into his system in any way; he then mentioned that he was in the habit of consuming a large quantity of cayenne pepper; the cayenne pepper was tested, and found to contain red lead, and the symptoms he was suffering from were those of lead poisoning.

There is a substance which I was requested by a gentleman in business in Birmingham to mention here, and that is *emery*. This is so mixed up with rust of iron, that he is unable to give the polish to his materials which he desires. Another article I would mention is *cyanide of potassium*, which is used by electro-platers in Birmingham. To such an extent is adulteration carried by the admixture of pearlash, that the electro-platers have considerable difficulty in plating their goods. I examined some samples of this cyanide of potassium, and found it to be extensively mixed up with pearlashes. I am aware that Mr. Redwood stated that the adulterations carried on in those articles were so generally well understood in the trade, that they did not interfere with the process of manufacture. I do not agree with that statement. At first, the electro-platers commenced to manufacture cyanide of potassium. They found that process to be exceedingly difficult, tedious, and troublesome. The druggists then commenced to manufacture it; after that it became so much adulterated, that before a workman would undertake some special plating, he stipulated that he must make the cyanide of potassium himself; and they tell me they are very much interfered with by the adulteration. Pearlashes are added for the purpose of giving weight. They are about 4d. a pound; cyanide of potassium is from 2s. 6d. to 4s. a pound; and without chemical analysis it would be impossible to detect the amount of pearlashes and bi-carbonate of potash; it is only ascertained by the amount of silver which is dissolved in a certain weight.

With respect to *coffee*, it is very much adulterated indeed; I have found roasted corn and chicory in it; and some time ago, at a watering-place, I observed not only cocoa-nibs ground up, but a quantity of mustard added to the coffee. I have examined many samples of coffee which have come into my own house, and which I have gone round to purchase in different parts of Birmingham. I have found the coffee to be very much adulterated with chicory. I lately sent out my servant to ascertain the effects of this exposure, and the probability of something being done. She went into one shop, and asked for pure coffee, and had a quantity of coffee given to her; a person ran after her, and said, "Will you come back? We have been fined £5, and we must put a label on this." Chicory was present in that parcel, though she paid for pure coffee. The practical way of testing for chicory is by cold water; if it is pure coffee, the water is very little discoloured, and if it is adulterated with chicory, it soon forms a very black solution. The chicory itself might be adulterated, but that process is the test of the purity of the coffee. The seller did not mention that the samples contained chicory; pure coffee was inquired for; the seller had not got pure coffee, but he gave the purchaser what he had; then, on the servant going out, thinking of the previous fine, he ran after her, and placed the label upon it without further comment.

I have found *essential oils* to be very much adulterated with common oils. And there is a very valuable medicine which we prescribe in obstinate constipation, namely, *compound extract of colocynth*; that is sold at different prices; you may purchase it at 28s. a pound, and, I believe, as low as 10s. I know that the effects of extract of colocynth are very different; in some cases it has a very powerful action, and in others a very mild action; I have prescribed a large quantity of extract of colocynth myself in severe cases without any effect whatever on the bowels; but on giving a dose of the better extract, it has had the desired effect at once. I have lately found *quinine* very much adulterated with salacine, that is, an alkaloid obtained from the willow bark; it may have some effect upon the system. I believe it is made in this country; a sample lately contained one-third. The price of salacine is 1s. 9d. an ounce; quinine, at present, I believe, is 9s. A simple test for it is a single drop of oil of vitriol; it produces a beautiful red colour. This mixture would be sold at the same price as ordinary quinine. This is an adulteration within the last fortnight or so. There is a substance named quinidine, which is made from an inferior bark. This is mixed up with quinine; it is easily detected by its insolubility in sulphuric acid and liquid ammonia. I have the statement of a case in which quinidine was supplied entirely for quinine. That was to a public institution. *Tamarinds,* which contain several vegetable acids, I have found acidified with sulphuric acid. Tamarinds are an exceedingly valuable medicine as a beverage in fevers and inflammatory diseases. *Cod-liver oil* I have found to be very much mixed up with other oils. This is difficult of detection. The way in which I test cod-liver oil is this: I have oil which I know to be made from the liver of codfish, and I take a certain quantity of the genuine cod-liver oil which I have seen manufactured myself, and add the same quantity of test to it, and then compare the colour of the two. During the late intense frost in Birmingham most of the genuine oils were in a solidified condition, whereas the others kinds of oils were fluid. It has been stated to me that the stearine has been removed from those oils, but I was not aware, nor do I believe that the profession are generally acquainted with that fact. In prescribing cod-liver oil we expect we are prescribing the constituents of the oils extracted from the livers themselves. It may be an advantage to remove the stearine, but I believe the medical profession are not certainly generally aware that that is done. In *milk of sulphur* I have found from 10 to 50 per cent. of sulphate of lime or plaster of Paris; this is extensively used in schools. I think the repeated use of sulphate of lime would be injurious. Plaster of Paris must be injurious in itself; it is perfectly innutritious and indigestible; it is like introducing into the system a quantity of clay. A medical man prescribes milk of sulphur as a purgative. Circumstances may arise in which he may mix it, but he ought to be the judge of those circumstances. I would not myself add to sulphur a substance like sulphate of lime.

Scammony I have found to be extensively adulterated with chalk and starch; I have seven samples here, which have been furnished to me by a druggist, who is exceedingly desirous to have something done to protect him in purchasing. The following statement I have verified by examining them myself. The first sample contained 85 per cent. of resin; that is a necessary element of scammony, and that is thought to be a good sample. Another had 75; the third, 66; the fourth, 49: the fifth, 39; the sixth, 32; and the seventh, 7½ per cent. of resin, and the resin extracted from this sample I do not believe to be the resin of scammony at all. Those substances are mixed up with starch and chalk in various proportions, which have not been ascertained. With regard to the price, the cost of the resin which was extracted in the best sample would be 47s. a pound; the next, 34s.; the next, 28s. 10d.; the next, 30s. 8d.; the fifth, 56s. 4d.; the sixth, 40s. 8d.; and in the seventh the cost was to the trader 146s. a pound. I believe that the druggists are themselves imposed upon, and I can give an instance. A quantity of *white precipitate* used for forming ointments came down from town adulterated to the extent of 65 per cent. with chalk and magnesia; the druggist was not aware of the adulteration, and had requested the manufacturer to send him a genuine article, inasmuch as his shop is one at which physicians' prescriptions are made up. He was not aware that the article was adulterated till I pointed it out to him. He paid the price of a genuine article. The next sample he got from a different place was also adulterated. I have found tartar and soda mixed with *sulphate of potash*; this is not an injurious admixture, inasmuch as sulphate of potash is itself a purgative. *Oxide of antimony* I have found to contain a quantity of chalk; *spirits of nitre* I have found very much diluted indeed with water, and frequently impure, containing a free acid, and thereby rendering it injurious to delicate persons, producing irritation of the stomach. The *red precipitate* used for ointment I have found mixed with red lead. I have here a sample of medicine prepared and sold in capsules; these are capsules containing, as it is said, concentrated *castor oil*, but really containing croton oil. I do not believe there is any castor oil at all. Croton oil is a medicine of a very violent purgative character; castor oil, on the contrary, is the mildest kind of purgative. I know a gentleman who was confined to his bed two days in consequence of having taken two of these capsules; one of these capsules contains ten drops of oil, and is stated to be equal to a teaspoonful of castor oil. Now castor oil cannot be concentrated, and therefore this is a gross deception upon the public. Croton oil itself is a very active purgative indeed; half a drop of croton oil would be a very fair dose for an ordinary person. I believe the sale of these castor-oil capsules has been interfered with in consequence of one manufacturer adding too much croton oil to the common oil; in fact, there was a quarrel between two manufacturers; I had that from a very good authority, a physician in Birmingham; one person introduced too much croton oil, and purged the people very violently. People go on taking those capsules, expecting they are taking castor oil. I endeavoured to enlighten the people of Wolverhampton. I produced those capsules, and showed them the utter impossibility of their being concentrated castor oil. After I came up from Wolverhampton a druggist came to me, and said, "You ought not to say too much about these concentrated castor-oil capsules; people know about them pretty well." A lady said, "You take me for a person of ordinary intelligence, but I was not aware that these capsules contained croton oil; I thought, in the progress of science, castor oil could be concentrated, and as it is a disagreeable medicine to take, I was exceedingly glad that it could be placed in capsules, and swallowed without any taste." *Balsam of copaiba* I have found to be extensively mixed up with fixed oils; this is an exceedingly nauseous medicine to take, and it has been prepared in capsules. A gentleman in Birmingham, eminent for a certain line of practice, was prescribing these capsules, containing balsam of copaiba as he thought; his patients got no better, and he found those capsules to contain linseed oil; there was not one particle of balsam of copaiba in them. I need scarcely say that during the whole of that time the disease was progressing, and in all probability would lead to certain results which would render the person miserable for life.

On the 6th of July this year, I tested in a respectable shop in Birmingham several *essential oils*, and these are the results: the oil of peppermint, both English and foreign, I have found to be mixed with fixed oils; oil of cassia also, of cinnamon, of lavender, of anise-seed, of cloves, of juniper, fennel, rosemary, sassafras, dil, and pennyroyal. This is an adulteration to increase the quantity of essential oil. I did not ascertain what oil was mixed up with the essential oil; it was a fixed oil, such as train oil or fish oil. Essential oils are volatile oils; when they are exposed to heat they pass off entirely; fixed oils, on the contrary, remain. By using fixed oils the strength of the volatile oil would be reduced; the difference in value would, of course, be very great. I tested those oils with the consent of the dealer. He is a person who is well disposed towards this movement. I said, "Will you let me test your oils?" I did so, and to his surprise he found they were so mixed up. *Tartaric acid* I have found to contain 30 per cent. of alum; I have found one grain of oxide of lead in 10 of *calomel*; *tartar emetic* I have found to contain free cream of tartar. I believe this to have been owing to an error in the preparation; but at the same time, of course, it is an impurity which ought not to be allowed to exist. If you prescribe tartar emetic for a sick individual, the effect is just the same; it matters little to him whether the adulterating substance has been added with an intention to defraud, or from mere carelessness. A medical man would take into consideration the state of disease, and apportion his dose accordingly. Cream of tartar would tend to lower the action of the medicine. I have found *senna* leaves mixed up with arzell leaves; *cream of tartar* I have found to contain one-half, or even three parts of alum in it; *mercurial ointments* I have found to be adulterated with blue clay; it is easily detected by applying heat to it; the entire fat is decomposed and passes off, and the mercury too, and then you have this solid, earthy substance left, which is the impurity. It materially affects the action of the ointment. *Iodine of potassium* is a medicine which is extensively used, and is an exeeedingly valuable remedy in various diseases; I have found this to have carbonate of potash in it. To prove how extensively these articles vary in price, I have here lists of drugs in which the Committee will see different prices for the same article. A chemical preparation ought not to vary at all; they ought to be in conformity with the Pharmacopœia. I have with me the druggists' Pharmacopœia, and a nostrum book of his own, and I can point out the discrepancy between the two; in one case certain articles are ordered to be mixed up, and in the other they are left out, or others substituted for them. The standard article can be purchased at a given price, but in spite of that the article itself can be bought in such an adulterated condition that the price is materially reduced from the price of that which is the standard. I will take the instance of *spirits of ammonia*, called sal volatile; that may be purchased at 1s. 10d. a pound, and at 2s. 4d.; *spirits of sweet nitre* may be purchased at 2s. 3d. a pound, and at 2s. 6d. Taking the commodity at 1s. 10d., that may be of a sufficiently good quality for many purposes. A medical man, in prescribing, prescribes according to the Pharmacopœia. Barbadoes *aloes* varies from £10 10s. a cwt. to £5 12s. a cwt. If you prescribed the inferior quality, it might be very dangerous to a sick individual. I have before me a book used by druggists in the preparation of tinctures and medicines to keep in bottles. The London College Pharmacopœia and this vary very much indeed, yet the same names are given to very different articles. Some of the druggists in this country are in the habit of keeping a Pharmacopœia of their own, and compounding their medicines in a very different way from that which is prescribed in the London Pharmacopœia. There is one commodity which I wish to bring under the attention of the Committee particularly, because it has a bearing upon the adulteration of gin. Here is a private prescription for *spirits of rosemary:* "Oil of rosemary, half-an-ounce; spirits of wine, four pints; water, six pints; alum and carbonate of potash, of each two drachms." The alum and carbonate of potash are added for the purpose of clearing the spirits of rosemary. The London College states, "Take oil of rosemary two drachms, rectified spirits a gallon, water a pint." So that there is no occasion for the alum and the carbonate of potash; but the druggist adding six pints of water to four pints of spirits of wine, the solution becomes turbid, and to clarify it he uses the alum and the carbonate of potash. The cost of one would be about one-third of the cost of the other. In the one case you have four pints of rectified spirits and six pints of water; whereas in the other case you have two drachms of oil of rosemary, and a gallon of rectified spirits, with only one pint of water. The cost of the private description would be about two-thirds less than the other.

I have the evidence of a physician attached to the General Hospital in Birmingham, who has met with great disappointments in prescribing for his patients. He says: "I sincerely and heartily hope that you will bring your movement relative to the adulteration question to a successful result, for I am quite sure that not only do the people suffer from adulteration in articles of food and drugs, but physicians have frequently to deplore the defect of action of their remedies in the treatment of diseases, from active remedies being rendered ineffectual by abominable adulterations. My experience in the treatment of acute diseases quite leads me to this opinion, and I believe that many valuable lives have been lost when adulterated drugs have been relied upon. Believe me, yours faithfully, BELL FLETCHER. July 20th, 1855." I have also a communication which I received from a druggist in Birmingham, Mr. Banks. He is very desirous that there should be some protection. He says: "Dear Sir,—I beg to congratulate you on the success in the House of Commons of our zealous and able Member, Mr. Scholefield, in obtaining power to nominate a Committee with the view of devising the best means to secure the public wholesome food, drink, and physic. After thirty-five years' active employment in the drug trade, and mature deliberation, I am fully persuaded the public have a powerful claim upon the Legislature to protect them from inferior and adulterated drugs, chemicals, and pharmaceutical preparations. I feel strongly that, to accomplish so laudable an object, the primary step should be the appointment of a fully qualified examiner at every seaport town, with power to condemn every article used in the compounding of medicine, either adulterated or below a fixed standard of quality. It is obvious, if only pure drugs could be imported by our merchants, it would simplify the detection of the vendors of impure articles; indeed, if allowed to supply the market with trash, under the names of scammony, and other gum resins opium, copaiba, rhubarb, sarsaparilla, barks (falsely sold as cinchona bark), &c., &c., &c., the difficulty of preventing the supply of articles not possessing the full medical properties of their respective kinds appears to me insurmountable. I feel sure you will have the assistance of all right-minded chemists and druggists, even on the low ground that it would tend to destroy a pernicious system of competition. Heartily wishing you success in your laudable undertaking, I am, yours respectfully, HENRY BANKS."

EVIDENCE OF HENRY LETHEBY, Esq., M.D.

MY attention has been directed a good deal to the investigation of adulterations of different kinds. I was employed in some of the analyses connected with the *Lancet* analytical commission. For nineteen years before that time I was engaged by the late Dr. Pereira in making investigations for his great work on *Materia Medica*. He is the great authority on all questions relating to *Materia Medica*. In the first place, I may say that it is a very difficult thing to get any article of diet pure; but there are several impurities which may be looked on as accidental. I do not think that in a general way we sufficiently distinguish between adulterations and impurities. I will give you one or two examples of what I call accidental impurities. Poisonous grain is usually met with in bread. The darnel gets into the farmer's wheat, and in the process of grinding is mixed with the flour quite accidentally. Then, again, the insects which are commonly found in brown sugar are quite accidental; they never come there as fraudulent impurities. And so, again, copper in jams and jellies is quite an accidental impurity, occurring in consequence of the acid of the fruit having acted upon the copper vessels in which it has been cooked. These are a few xamples of accidental impurities occurring in food. Perhaps I cannot better employ the time which is at my disposal than by giving the Committee a general view of the result of my experience upon this subject. I may divide fraudulent adulterations into three or four kinds. Many adulterations are effected for the purpose of increasing the weight or bulk of a body. For instance, inferior arrowroots, which are not worth more than from 1½d. to 6d. a pound, are made to take the place of expensive arrowroots. Again, farinas are used to adulterate chocolate and spices. Then again, starch sugar, and sugar made from diseased potatoes, is often employed to adulterate the cane sugar, and also for manufacturing cocoa paste and chocolates. That sugar is not injurious at all, but it has not the sweetening power of the other, and you must use a larger quantity. Perhaps, to a certain extent, the mixture of gelatine and isinglass would come under this category; a mixture which is more for the purpose of increasing its bulk than anything else. Water in milk, and gin, and vinegar, is also an adulteration, for the purpose of increasing the bulk of the article.

I have had some connexion with the investigation of isinglass on a previous occasion, and have heard the evidence which has been given to-day on the subject of *isinglass*. I do not altogether concur in the evidence of Mr. Wallington; I differ from him in this respect: it is true there is not any chemical distinction between isinglass and gelatine, but there is a great distinction in respect of the price, and in respect of the taste of the article, and also a great deal of difference in respect of the action upon the human body; for instance, the flavour of ordinary gelatine is more like that of glue than genuine isinglass; it is not unfrequently made of the most impure materials. Good isinglass never disagrees with the stomach, but gelatine does; when isinglass has been boiled for a little time it absorbs oxygen from the air; it is well known that soups which have been warmed up two or three times become very injurious. Now gelatine is made from boiling the skins of animals, and an injurious effect will be produced upon it from the action and the heat of the atmosphere. That is not a necessary impurity, and I do not think that a person is justified in selling this particular article, and calling it isinglass. Gelatine is chemically the same as isinglass, but physiologically it is not the same. If we were to put it into the hand of a chemist, and tell him to analyse it, he would not discover the difference between gelatine and isinglass; but if both were administered to a delicate stomach it would soon detect the difference. I have examined the particular kind of isinglass which has been made the subject of observation to-day. There is no scientific test to distinguish the one from the other when they are both pure, but we can distinguish inferior gelatine from isinglass very readily.

There is a second class of adulterations, namely, those which are practised to give a false strength to an article; for instance, sulphuric acid is commonly put into *vinegar;* by law one part in 1,000 is permitted, but frequently I have found six parts in 1,000. The common vinegar sold about the streets, which we see poor people shaking upon oysters, is nothing but sulphuric acid coloured with burnt sugar. Cocculus indicus is commonly introduced into *beer* for the purpose of giving a false strength to it. In one case which came under my knowledge the publican was found using it for the purpose of adulterating his beer to be sold the next day; the police had access to his premises, and took possession of everything on the table; the materials were brought to me, and I found that the publican, upon shutting up, had set about the work of adulterating his beer for the morrow. Then again, roasted sugar or black jack is employed very often for the adulteration of *coffee*, to give a false strength to it, and also for the purpose of adulterating chicory. Catechu and other substances are frequently introduced into *tea*, to give a false strength to it.

A third class of adulterations, which are practised for the purpose of improving the appearance of an article, and those are the most serious adulterations; for instance, the facings upon tea are sometimes very injurious. The salts of copper, which we find in pickles and in preserved fruits, are very injurious. Alum, again, and chalk, which are put into bread for the purpose of improving the appearance, are injurious. It frequently happens that flour which has been a long time upon the road becomes sour, and it is a very common thing for bakers to introduce chalk into it to correct the acidity. Of that I can mention one most striking instance. An emigrant vessel, about to start for Australia, had on board a quantity of *biscuit*. Fortunately, they gave some of it to the crew about a week before the vessel sailed; they found it disagreed with those who ate it; it produced extreme constipation. The biscuits were sent to me for examination, and I found no less than about 31½ grains of chalk in an ounce-and-a-quarter of biscuit. It would assuredly have killed the whole of the crew if it had not been discovered before they got to sea. Another adulteration is the introduction of ferruginous earths into sauces, and cayenne pepper in snuff and other things of that kind, in which there is no reason whatever why such substances should be used. Ferruginous earths are in some instances contaminated with arsenic. Oxide of lead, chromate of lead, and bi-chromate of potash, which are terrible poisons, are commonly met with in *snuff;* in fact, the medical practitioner finds many cases of poisoning by lead, which he traces from one cause and another, till he ultimately finds that it was taken into the system mixed with snuff. But, of all adulterations of that kind, introduction of poisonous pigments into *confectionery* is the most common and the most serious. There is not an article of confectionery in this country which is not so coloured, I have before me a sample of such confectionery, in which there is enough chromate of lead to do serious mischief. I purchased that specimen of confectionery at a large and respectable shop. A case of poisoning from this cause occurred at the London Hospital about two years ago; about twenty people were poisoned by confectionery which was sold by a Jew in the neighbourhood of Petticoat-lane. He had bought up the refuse stock of a large City confectioner, and distributed among the people in that neighbourhood, and twenty-four of them were poisoned by it. They were brought into the hospital, and emetics were administered to them. The contents of the stomach were sent to me to analyse, and I found in them lead and arsenic, and this was found, upon inquiry, to have been the cause. Every article of confectionery in this country is poisoned in this way. Continental confectionery never is so poisoned. There is no reason why people here should use inert pigments, for our confectioners do not approach foreign confectioners in reference to the appearance of their confectionery, and yet foreign confectionery does not contain any poisonous matter whatever.

It would be very easy to devise a remedy for the evil to which I am now alluding. The Government, in my opinion, ought to point out what are the pigments which may be used, and what are deleterious, and ought to be avoided. I have now mentioned, I think, the most important adulterations in the third class. A fourth kind of adulteration consists in the poisonous matters which are introduced for the purpose of improving the flavour of confectionery. A number of essential oils have lately been produced artificially by means of chemistry, and some of those contain terrible poisons. There is, for instance, the essential oil of bitter almonds;

it is about four times as strong as the strongest prussic acid sold in the shops, and yet it is frequently to be met with in the kitchen, and is used by the cook without any regard to quantity. It is used as a ratafia flavour. Essence of pear and of pineapple contain poisonous materials, and they have done serious mischief lately. These are the principal adulterations which I desire to refer to in respect to food.

I have given particular attention to the adulteration of *coffee* with chicory. These substances do not contain the same properties. The principle contained in coffee may be considered as essential to life, inasmuch as all nations use it; it prevents the wear and tear of the body. Now there is nothing in chicory which can do that. Chemically, there is no difference between beet-root chicory and what is called real chicory; microscopically you can discover the difference. With respect to drugs, I may say that the great cause of the adulterations which we find has reference to the mixing of inert matter with powdered drugs. In fact, there it is that you will find the greatest adulteration practised. There is a custom adopted among druggists which they call the 4 per cent. system; that is, if a cwt. of drugs are sent to be ground, 108 lbs. must be returned, quite irrespective of the loss in grinding and the water which is given off in the act of drying. Now, we know from experience in the case of opium, from 15 to 25 per cent. of water is given off; therefore, if 4 per cent. only is allowed, they must put something to make it up. There are very few drugs which lose so little as that in drying. In order to make up the bulk which is lost, the drug-grinder will introduce saw-dust; they call it "powder of post," which is commonly employed for the purpose of making up the quantity. Sometimes, however, there are things found in powdered drugs which I believe must be introduced in order to effect pulverization. For instance, we find sandy matter in *opium*, and starchy matter. Now, resinous drugs cannot be powdered unless something is introduced; they become agglutinated and stick together. The heat produced by the friction of the mill causes them to agglutinate, and they must put in something to grind them. I believe that generally accounts for the sandy matter we find in opium. I would not call that, within proper limits, an adulteration. In making an examination of about 200 samples of powdered opium, which have been supplied to me partly through the *Lancet* Commission and partly in my experience as lecturer on chemistry at the London Hospital, I have found that the powdered opium of English commerce rarely contains more than 5 per cent. of the active principles, morphia and narcotina; whereas the crude opium contains from 12 to 14 per cent. That is not such an adulteration as I would speak of as an accidental adulteration. They have mixed with the opium in grinding a quantity of inert matter. In such a case, a physician who prescribed opium to a patient would find that his medicine produced a very different effect from that which he intended, and if he went on increasing the dose, and the prescription happened to be taken to another druggist who was more particular in the quality of his drugs, death might be the consequence.

There are many adulterations which are practised abroad over which a druggist has no control. We have heard of *scammony* being adulterated; but the adulteration practised upon scammony is practised by the Jew at Smyrna who makes it up for the English market. I believe, in bringing it down to the port, he is obliged to introduce a quantity of matter to prevent it decomposing; chalk and starch are put in to absorb moisture, so that it shall not undergo decomposition. That is often spoken of as adulteration; but within a limit, I cannot regard that as adulteration. But there is a limit beyond which it ought not to be permitted. Then, again, in reference to the French *alkaloids*, they are nearly all of them adulterated; those of them which are manufactured in this country are extremely pure. Then, again, *sulphate of quinine*, which comes from France, is very much adulterated. I have had occasion to give evidence on the French sulphate of quinine, and it is often adulterated to the extent of between 50 or 60 per cent. with sulphate of quinidine. The sample I have here was sent to America, and stopped upon its introduction there by the examiner. I believe 6,000 ozs. were ordered by an English chemist from a French manufacturer; it was stopped in America and sent back to this country; and upon an examination I found that it contained that quantity of adulteration. That would be admitted into this country without any drawback. The sulphates of quinine which are manufactured in this country are always to be depended on; sulphate of quinidine is now made here to a large extent; it is a fraud upon the pocket perhaps; the adulteration of sulphate of quinine is practised before it comes into this country. *Musk* is an article which is very much adulterated; false bags of musk are made to imitate genuine musk. It is nothing but a piece of skin of the animal cut out; a bag made and filled up with dried blood. That is done with the object of profit; musk is worth about 63s. an ounce, and this is worth not so many farthings; the counterfeit musk bags have the appearance of the genuine musk bag; it is only a practised eye that will discover the difference, and it has the powerful odour of musk, and till a chemical examination is made, you do not discover the fact of there being so little musk there. Musk is used as a powerful stimulant in certain nervous affections, and this imperfect article is wholly without effect. It has no ill effect, however, except to disappoint the physician.

There are some other adulterations which are practised by the wholesale manufacturer without his being aware of the importance of the matter; he sends an article into commerce which is not what it ought to be. Take *milk of sulphur;* that is now generally charged with half its weight in plaster of Paris, but it is made according to a formula which originated with the College of Physicians, and which they go on using at the present time. To make milk of sulphur it is first boiled with lime; muriatic acid should then be added to it, which gives a pure precipitate; but if you add sulphuric acid it will combine with the lime, and the plaster of Paris will go down with the sulphur; that is not the property at all of the genuine precipitated sulphur, which is sold as a laxative, but is a powerful costive-producing agent. I do not think chemists are quite aware of the manner in which milk of sulphur is produced. Another preparation we find in the druggist's shop is *calamine:* it should be carbonate of zinc; it is sulphate of baryta. I question whether a medical man would be able to recognise the operation of a pure calamine ointment; he has got into the way of using this thing, and it accomplishes what he wishes. Instead of carbonate of zinc being used where calamine is prescribed, he now uses sulphate of baryta. It has been used so long that if the pure calamine ointment were to be employed without the medical man knowing that it was to be so, he would find a very different action to what he intended. Sulphate of baryta is extensively used to adulterate white lead.

I think it right to say that there are many drugs which a few years ago were very much adulterated, which we do not now find to be so; I think it is possible some of the evidence you might have heard on the subject of adulterated drugs may have reference to the drugs six or seven years ago. The Pharmaceutical Society having taught chemists how they should recognise the genuine articles from the adulterated ones, and having pointed out the necessity of using the genuine articles, the better education of chemists has produced the difference. I think it has a moral influence upon them also; they become banded together, and take a moral view of the question. There are many important drugs which differ very materially in price, which may depend upon the colour. I have examined *castor oil* for the *Lancet* Commission; I examined thirty samples, not one of which was adulterated. *Cod-liver oil* is very rarely adulterated. I speak from what I have myself seen; I have examined scores of samples obtained from various towns, and found no adulteration practised. We determine the quality of cod-liver oil in several ways, and not only the action of sulphuric acid upon the cod-liver oil, whereby you produce the violet tint. We find the proportion of bile principle and of iodine; and if we do not find any great difference, those are the medical principles in cod-liver oil; the oil itself does nothing; it is simply the bile principle and the iodine which are the active qualities. The oil obtained from the liver of another fish may be employed, but we cannot discover that, and I do not call that an adulteration. The liver of every fish contains an oil which is charged with iodine and with bilary matter; it is very likely indeed that they all have the same therapeutic action. If the liver be made hot in order to extract the oil, as De Jhongh does, the oil is of a dark colour, and very likely to disagree with the stomach; but English oil is extracted from the liver when cold; there is a difference in the colour, produced by the difference of temperature at which the oil is extracted. Cod-liver oil is now manufactured a good deal in Newfoundland, in order that the liver shall not undergo putrefaction, but that the oil shall be extracted there, instead of the liver being salted and the oil extracted in this country. The oil would be in the same therapeutic state, only the liver being putrid, the oil may be offensive to the taste. If the liver is submitted to heat at the time the oil is expressed from it, it is very likely that the action of heat may injure the oil, or if the liver be allowed to putrefy, the oil is likely to disagree with the patient; but the oil of English commerce is very bland, very free from odour, and very free from colour also, and almost tasteless; it is a very unobjectionable oil in every way. I think there is no motive to adulterate cod-liver oil. I do not think you can get the livers of other fish to yield a sufficient quantity of oil for the purpose. The liver of the skate yields a similar oil, the action being very much the same as cod-liver oil, but it could not be used for it, because of the strong fishy odour. Cod-liver oil is free from odour, whereas skate-liver oil, and some other fish oils, have a very unpleasant fishy odour; but we have no chemical means of distinguishing the one from the other. We can only detect whether the oil is pure or not, by ascertaining the proportion of the bile principle and the iodine contained in it. Other oils do not contain the bile principle, nor do they contain iodine; but the livers of all fish yield an oil containing iodine and the bile principle, and it is exceedingly probable they would have the same effect upon the human frame. There is this difference, that De Jhongh's oil may be taken for a longer time without the patient getting disgusted with it; frequently that is an impediment to the administration of oil, inasmuch as after going on for a fortnight or three weeks, the patient gets disgusted with the remedy. De Jhongh's oil will stay for a longer time upon the stomach than any other; it may be because of the care used in the preparation of it; he may get rid of certain acrid principles which we cannot recognise, but which are apt to disagree with the stomach.

Sarsaparilla cannot be adulterated. The extract of sarsaparilla may be made of sarsaparilla which contains an enormous quantity of starch, and such descriptions of sarsaparilla would not have the active principle which good sarsaparilla should possess. I have examined many specimens; there are two kinds: the Honduras sarsaparilla contains a small quantity of extract, and a very large quantity of starch; the Jamaica contains a great deal of extract and very little starch. In boiling down, the starch will yield the bulk of what people commonly call extract. The extract I refer to is the active principle, which differs from starch; Honduras sarsaparilla will yield the largest quantity of that; therefore it is that the one which is employed to make the extract is the one which possesses the least active principle. It has been given in evidence that some of the extract contained no sarsaparilla at all, but liquorice only.

All extract of sarsaparilla contains liquorice, and I know of no positive test for determining the quantity of sarsaparilla.

In speaking of *gelatine* I do not distinguish between refined gelatine and glue gelatine; they are all the same, except that one is made a little more carefully than the other, or has not been exposed to so high a temperature; but glue gelatine is sometimes used, when clarified, for the very purpose of adulterating isinglass. In making gelatine, if they have an object in view, they will be careful in the application of heat; in making glue they are not careful; but having made glue, if there were a demand for it, they could convert it into gelatine, and bleach it. Most of the gelatine which comes from France comes from a large horse slaughterer's in the neighbourhood of Montmartre. Not many years ago there was put into my hands by the Excise something they knew nothing about. It came in at an *ad valorem* duty, and they asked me what it was. I found it was the hamstring of the horse, and it was traced to a large gelatine maker. I dare say the same thing in Holland would be employed in the manufacture of glue, only there they would not be so particular in the solution of it, and they would not care about its being coloured. Here they dissolved it a little more carefully, and made gelatine of it. After they have gone through the process carefully, there is a substance left which ought not to be found in gelatine; that is, it is gelatine which has been acted on by heat, and is found to disagree with the stomach. Jellies are often prescribed by medical men during the convalescence of a patient when the stomach is very irritable; and if those jellies are made of gelatine which has been exposed to a high temperature they will generally disagree with him, whereas jelly made from Russian isinglass would not do so. The element is not precisely the same in the two cases; it has undergone a molecular change. In fact, there is only a molecular difference between isinglass and gelatine. The fact of there being that molecular change leads to a different effect in the administration of that gelatine upon the system.

I have a general opinion that adulteration is practised extensively both in drugs and articles of food. As to the best mode of preventing it, in respect of articles of food, I had rather not offer a suggestion; the question is one which I feel I cannot cope with. But with respect to drugs, I think it would be possible to do away with the adulterations now practised. I think the matter might to a great extent be left to the Pharmaceutical Society, who have done a great deal of good within the last few years. Another means would be insisting upon the College of Physicians in the three countries agreeing in regard to the quality of the chemicals; for a prescription written here and taken to Scotland may kill a patient, so great is the difference in the character of the drugs. I do not think we have any very great number of adulterations practised upon the drugs supplied to the people. I have examined some scores of specimens of carbonate of soda, and I found in druggists' carbonate of soda rarely anything more than two or three per cent. of sulphate of soda, which is an impurity not worth considering, and it would cost a great deal to get rid of it. The College of Physicians have a power of visiting druggists' shops; and I think if they were more frequently to exercise it, it would do good. They have the power of committing a person to Newgate for selling a thing which does not come up to their standard of what the drug should be, but the power is never exercised. I do not think druggists have any objection to the use of that power; I never heard of any. It would require much time to qualify a man to be an inspector of either drugs or other articles which are said to be adulterated. It would require a special education for the purpose. Microscopical tests are very easy, and very little education would enable a man to discover the greater number of the frauds which are practised. He might discover almost all things except those which are injurious to health. Those chemical compounds which we find in confectionery require great chemical knowledge, experience, and tact to discover. Supposing we had a system of inspection, I think that one class of inspectors need not be so highly educated as another. There might be one set for ordinary purposes, and another to refer to in case of doubt; but that is a matter which I have a good many difficulties in giving any opinion upon. The scheme which I would suggest would include the appointment of public inspectors; but I see this difficulty; you would require such a number of them, that I hardly know how you could meet the expense. It has been stated that if there were a few in actual existence, it would have a great effect upon the trade; but still you must put the execution of the law into practice, and it would entail a great deal of labour. I think you must have a large staff of officers; in my own experience I know what happens: I am engaged in the examination of drugs and articles of food, and when an important question arises, as to the adulteration of coffee, for instance, I have more things sent to my laboratory than I can get through in a month, or two or three months. Under those circumstances I have more thrown upon my hands than it is possible to do; what it would be if there were a public inspector, I do not know. The fee paid to me is never less than a guinea; generally five guineas. Things are referred to me generally by people in the trade; sometimes by people who fancy that things have disagreed with them. The Drug Committee of our hospital also refer things to me. When a drug is found not to produce the effect they expect the drug is submitted to me for examination. It requires a great deal of time. Take the case of confectionery; we must get rid of all the sugar which is in that confectionery; we must keep the coloured pigment for some days to separate the one from the other, and then it must be submitted to the process of testing. We know generally what pigments are used, and we should look for those which we should suspect to be there from the appearance. That inquiry is assisted to a considerable extent by a true knowledge of these things. Still we are obliged, in cases where a charge may be made against an individual for selling a thing which has produced an injurious effect, to go through the inquiry most carefully. We must not suspect, but prove that the thing is there.

The plan they have adopted in the United States of a scientific man being appointed as a public officer to examine medicines imported from Europe has been found to act very beneficially. That does not require a very large staff; I believe there is only one examiner, with assistants, at each of the large import towns. The knowledge that the medicines to be sent out are to be examined by a public officer has an effect. They have no examination in the towns generally; they make an examination of the drugs as they come into the country. They do not examine other things. The French law in respect of confectionery will not permit any but a certain class of pigments to be used; they will not even permit coloured paper to be used for wrapping up confectionery, unless it is stained with a certain class of pigments. A druggist is not permitted to keep poisonous drugs, except in a cupboard, the key of which is kept by the mayor of the commune. A few drugs, such as we import, are extensively adulterated abroad; but not so much, frequently, for the purpose of any fraudulent adulteration as to keep them. Many drugs will become injured upon the passage, and they are obliged to do something to them before they send them away. I do not think it would be worth while to have an examiner at the seaports here. I think there is that degree of feeling among the druggists of this country, that they are not at all disposed to buy a very bad article. I know that Indian opium, which is so bad that it does not contain above 5 per cent. of the active principle, comes to this country, and there is no druggist who will buy it. So it is with respect to most drugs in the bulk. Druggists in this country do not like to purchase a bad article; the drugs are sold by auction, and they do not like to have their names put down as the purchasers of those bad things.

EVIDENCE OF MAURICE SCANLAN, Esq.

I AM a Licentiate Apothecary of the Dublin Apothecaries' Hall. I matriculated at the Dublin University as a medical student, but I gave up the study of medicine for chemistry, and have continued it ever since. I have been a manufacturer of chemicals extensively, both for use in medicine and the arts, in Dublin, Wolverhampton, and London. I have been resident in London for some years as a consulting and analytical chemist. I have the management of a chemical factory belonging to an extensive drug-house in London for making chemicals for use in medicines and the arts. With regard to food, I have had very little to do, except that some years ago, when residing in Wolverhampton, I found alum both in *bread* and *flour*. I read a paper before the Literary and Philosophical Society in Wolverhampton; I obtained samples of bread and flour from various places; I had the management of the chemical works at Whitby for some time, and we sent away from there a large quantity of ground alum, and it was an understood thing by the agents that that ground alum was used by bakers. A great deal was sent away in a crystallised state, and a great deal in casks as ground alum. I know in Wolverhampton there was a good deal said about the adulteration of bread with alum, and we found that the bakers were afraid to use it, and we had every reason to suppose that alum was mixed with the flour by the millers; I purchased upon that occasion small parcels of flour at small dealers', put in bags for the poorer classes, and I found alum in the flour.

I have been, among other things, a licensed rectifier in Dublin for fifteen years. That has given me some acquaintance with the spirit trade. I became a licensed rectifier for the purpose of making spirits of wine; I was never a maker of gin or of cordials, or anything of the kind; but I have heard the evidence given here, and I do not see any reason why a retailer should mix water or anything else with his *gin*; I do not see why it should not go into consumption directly as it comes from the rectifier. A pure, flavourless raw spirit is made by the distiller; upon that the duty is paid; it goes to the rectifier; he distils it with other ingredients to make gin,—with juniper berries for example. He lowers the strength in rectifying it. I believe formerly the raw distiller was not allowed to send out raw spirit of any strength above 25 per cent. above proof; recently they have been allowed to send it out at 50 per cent. above proof to the rectifier. There is no limit to the reduction as practised by the rectifier, except the custom of the trade. It was stated by several witnesses that the retailer reduces his gin, and then is obliged to add finings to brighten it; that deteriorates the gin, inasmuch as it throws out of solution the essential oils, which are added to give a peculiar flavour to constitute gin; water has that effect on it. The essential oils are soluble in alcohol, but if they dilute the alcohol too far, the oils are thrown out of solution, and this process of filtration is resorted to to make it bright again, and to look well to the eye.

There is a substance I have known to be sold as *soluble cayenne*, which contains both copper and vermilion; the copper is accidentally introduced into it from the mode of preparation. It is taken from a copper still. They make a sort of tincture of the cayenne pepper, and they filter it, and pour it upon a quantity of salt in a copper still; it then takes up a little copper, and then this salt is dried, and mixed with vermilion and rose-pink. Vermilion is a poison. The amount is very small; they put about six drachms of vermilion to about three pounds of salt. I think a broad distinction should be made between accidental impurities and adulterations. Accidental, or more properly incidental, impurities find their way into preparations in two ways; both from the impurity of the material employed, and sometimes from the nature of the vessels. In most substances you may get some iron or copper, and in some substances you may get arsenic. You get arsenic in *oil of vitriol* to a great extent: that arises from the employment of pyrites instead of sulphur. Oil of vitriol is made in large quantities by alkali makers, and when the price of sulphur is high they use pyrites instead, and pyrites almost invariably contains arsenic. Irish pyrites contains a good deal, but I have understood that the Cornish pyrites contains still more. Some few years ago I found an enormous quantity of arsenic in sulphuric acid here in London. It finds its way into muriatic acid made from that sulphuric acid, or in the manufacture of which that sulphuric acid is employed, and hence it may be very mischievous. A mixture of muriatic acid and soda has been used in bread, and I have seen muriatic acid containing a very fearful quantity of arsenic. The object of using muriatic acid in bread is to make what is termed unfermented bread. Muriatic acid takes the carbonic acid from soda, and acts instead of yeast.

I have also found impurities in chemicals used in medicine, arising from the ignorance of the chemist who prepared them. There are some chemists who undertake to manufacture chemicals used in medicine, who are ignorant of the ordinary principles of chemistry, and hence I have found the articles which they have sent out very impure. I think a broad distinction ought to be made between those impurities and purposed adulterations. I have met with a great many articles which have been spoken of here adulterated purposely. I discovered by accident an adulteration of *powdered jalap* to a great extent. I went into a druggist's warehouse one day in Wolverhampton, and saw a number of powders ready folded in 7 lb. or 14 lb. parcels. There was one I did not know. I asked the warehouseman what that one was. He told me it was powdered jalap. I said it was not powdered jalap. He insisted that it was. I said, "It is not the colour of jalap." I took a corner of the paper and moved the powder, and I saw that the mass of powder had a different colour from the surface. I said to him, "That is a very curious thing." It looked very like the effect which rays of light produce upon guiacum. The man began to laugh, and told me it was jalap-root and guiacum shavings sent in equal weights to the mill to be ground, and sold as jalap powder. I spoke to the druggist afterwards, and told him if he must mix anything with the jalap he had better mix something else. Guiacum shavings are not injurious.

The general result of my experience is, that there is a considerable amount of adulteration in drugs and chemicals used in medicine, and therefore considerable risk that the prescriptions of physicians will not have their intended effect upon their patients. I heard Mr. Redwood's evidence, and I do not think he admitted adulterations to the extent to which they really exist. I have no doubt the Pharmaceutical Society have done a great deal of good in the education of chemists and druggists, but I believe that that education is not compulsory here, as it is in Ireland. The adulteration of soda has been spoken of a good deal. I believe the article of bi-carbonate of soda is very seldom adulterated; at least it has never come under my knowledge; but there is an article called soda, which is used in washing, and that I know has been adulterated to a great extent. I knew a man living at Whitechapel whose trade was to buy crystals of soda and adulterate them with Glauber salts. I believe it found its way into the oil-shops, and was bought up by the poorer classes for washing. Even for washing purposes Glauber salts would not be useful; it is like adding water to gin. Large consumers of soda, such as makers of soap and so on, buy it almost directly from the manufacturer, and they buy it by certificate and according to its real value; they buy their white ash exactly as a rectifier buys his spirit, according to its strength. I have had a knowledge of most of the drug-houses in London for thirty years and upwards, and I do not believe that any of the large houses lend themselves to any adulteration whatever; and the same thing may be said of a great many of the retailers. There are hundreds of houses in London one may take things from blindfold. I do not believe the statement made by some of the drug-grinders, that there are some things which it is necessary to add foreign matter to in order that they may be powdered. I heard Dr. Letheby say that it was necessary to add something to opium. Now that is not the fact, for I can remember, as an apprentice, having dried and powdered and sifted a large amount of opium through a fine sieve without the addition of any extraneous matter whatever. There is a species of adulteration which was found out accidentally not long ago by Dr. Taylor, and I made some experiments upon it: it is nux vomica. This adulteration was traced to the drug-miller, and his excuse was, that the substance was so tough that it was impossible to powder it alone, but it was necessary to add guiacum to it; that is not the fact, for I have dried some nux vomica, and I had it powdered in a mortar and sifted through a sieve without any difficulty. Some mode of inspection would do a great deal of good. The principal check to it, I think, would be improved education on the part of chemists and druggists, and on the part of those who buy the articles which are said to be adulterated.

INDEX.

PAGE
Acetate of Copper 83
Adulteration, definition of . . 75
  Effect of, on the revenue 39, 74, 173
  Objects of 1
  Suggestions for the prevention of, 37, 44, 74, 84, 86, 90, 123, 168, 179, 185, 193, 225, 252, 258
African pepper 210
Ale 5, 75, 104
Alexandrian senna . . . 150
Aloes 240
Alum in bread, its effects on the digestive organs . . 57, 189
American flour 185
  Salt meats 186
Ammonia, spirits of . . . 240
Analytical department of the Board of Excise . . . 194
Anchovies 2, 6, 20
  Essence of 21, 126
Anchovy paste 20
Aniseed, oil of 239
Annatto 2, 30, 80, 88
Antimony, oxide of 238
Apothecaries' Hall 32
  System of buying drugs at . 50
  Supply of drugs from, to the army and navy 54
Application of the microscope to the detection of adulterations 35
Armenian bole 155
Arrowroot . . 2, 6, 9, 54, 109
Assafœtida 83
Assam tea 12

Bad salt meats 186
  Water, influence of, in spreading cholera 45, 80
Bakers, adulterating, how punished in France 57
Balsam of copaiba 238
Beading mixture 161
PAGE
Beef, potted 20
Bi-carbonate of potash . . . 83
  Soda . . 136, 163, 169, 257
Biscuit, ship 244
Bloater paste 20
Bloaters, potted 20
Blue pill 146
Bole Armenian 155
Bonka 211
Borax 149
Bottled fruits and vegetables 2, 18, 41
Brandy 77, 203
Bread 2, 5, 11, 56, 90, 102, 108, 112, 189, 215, 232, 254
  Adulteration of, in France . 153
Butter 2, 22, 97

Cafeine 211
Calamine . . 89, 123, 153, 248
Calomel . . 83, 101, 139, 170, 239
Candied citron peel 21
Carbonate of potash 83
  Soda . . 136, 163, 169, 257
  Zinc 153
Cassia, oil of 239
Castor oil 249
  Capsules of 238
Cayenne pepper, 2, 17, 80, 178, 234, 255
Cheese 80
Chemicals used in photography . 130
Chicory. 2, 6, 70, 199
Chinese, adulterations of tea, by the 13, 207
Chloroform. 55
Chocolate 65
Cigars. 23
Cinnamon 2, 16, 176
  Oil of 239
  Powder 171, 177
Citrate of iron 123
Cloves 16
Cochineal . . . . . . [illegible]

PAGE
Cocoa and chocolate, 2, 6, 11, 64, 106, 211
Cod liver oil . 54, 144, 236, 249
Coffee, 2, 6, 66, 98, 105, 109, 194, 197, 235, 244, 246
In France 67
College of Physicians, power of the, to visit chemists' shops, 53, 91, 184 252
Colocynth, compound extract of . 236
Colonies, exportation of adulterated drugs to the . . 181
Competition, nature and effects of 84, 220
Compound extract of colocynth . 236
Confectionery, coloured, 2, 5, 26, 42, 80, 245
Regulations for the manufacture of, in France . . 27, 253
Conventional adulterations . . 152
Copaiba, balsam of . . . 238
Copal 88
Council of Health in France . 84, 179
Cream 5, 14
of Tartar 83, 239
Currant jelly 6
Curry powder 3, 18
Custard powder . , . . 3
Cyanide of potassium . . 129, 235

Damaged nutmegs 178
Defective drainage of London . 116
Definition of adulteration . 75, 161
Difference between the Pharmacopœias of London, Edinburgh, and Dublin . . 171
Dil, oil of 239
Distinction between adulterations and impurities . 128, 242, 255
Drug grinding 32, 52, 141, 246, 257
Drugs, exportation of adulterated, to the United States, 47, 167, 180
Rejection of, for adulteration, at St. Thomas's Hospital . . 121

Effect of adulterations on the revenue . . . 39, 74, 173
Emery 234
English rhubarb 53, 170
Essence of anchovies . . 21, 126
Jargonel 78
Lobsters 20
Pineapple 78
Shrimps 20

PAGE
Essential oils 236, 239
Excise, suggested extension of the operations of the . . . 39
Extract of colocynth, compound . 236
Opium 122
Sarsaparilla 250

Fennel, oil of 239
Fish oils 187
Sauce, Lazenby's, Harvey's . 20
Flour, 3, 5, 11, 59, 94, 108, 185, 188, 232, 244, 254
France, regulations in, for the manufacture of coloured confectionery . . . 27, 253
Ordinance in, for the prevention of adulterations, 38, 57, 84, 253
French alkaloids 247
Fruit essences, how produced chemically 78

Galactometer, to detect adulteration in milk 79
Gelatine . . 148, 223, 243, 251
German yeast 104
Gin, 3, 5, 29, 76, 105, 156, 201, 255
Ginger 3
Ground 16, 172
Gooseberry jam 21
Government sanction of certain adulterations . . . 179
Greengage jam 21
Greengages, preserved . . . 19
Ground ginger . . . 16, 172
Gutta percha 185

Hops 195, 204
Substitutes for 182
Hydrocyanic acid 123
Hydrogenated iron . . . 149

Imitation of coffee berries, 106, 109, 194
Improvement of the Pharmacopœia 171
India soy 20
Innocuous colours for confectionery 42
Iodine 83, 140
Of potassium 240
Isinglass, 3, 14, 55, 148, 223, 243, 251
Jalap 4, 30, 172, 256
Jams 21
Justification of substitutes and mixtures 219

PAGE
Lard . . . 3, 5, 21, 149, 186
Laudanum 91
Lavender, oil of 239
La veno beno . . 62, 110, 211
Lazenby's Harvey's fish sauce . 20
Legislative encouragement of certain adulterations . . 183
Lie tea 13, 50
Linseed meal 83
Liquor ammonia fortis . . 123
Liquorice powder . . . 122
Litharge 83
Litmus 6
Lozenges 108

Mace 16, 178
Magnesia 83, 146
Malt 204
Manna kroupe 109
Marmalade 3, 21
Mercurial ointment . . . 239
Mercury 83
  White precipitate of . 121, 237
Microscope, use of the, in detecting adulterations . . . 35
Microscopic examination of Thames water . . . 43
Milk . . . 3, 5, 14, 78, 98, 187
  Of sulphur . 135, 155, 237, 248
Mixed spices 3, 17
Mixtures, justification of . . 219
  Propriety of legalising . . 40
Morphia 100, 147
Musk 248
Mustard . 3, 6, 10, 55, 109, 232
Mysteries of the public line . . 159

Natural impurities in vegetable drugs 143
Nitrate of potash 84
  Silver . . . . . . ib.
Nitre, spirits of . . . 238, 240
Nitric ether, spirits of . . . 123
Nutmegs 16, 177
Nux vomica 258

Oatmeal 3, 12, 108
Oil of cassia 239
  Cinnamon . . . . . ib.
  Cloves . . . . . . ib.
  Dil . . . . ib.
  Fennel . . . . . . ib.
  Juniper . . . . . . ib.
  Lavender . . . . . ib.
  Olives 187
  Peppermint 239
  Rosemary . . . . . ib.
  Sassafras . . . . . ib.
  Pennyroyal . . . . . ib.
Oils, essential . . . 236, 239
  Fish 187
Olives 20
Opium 4, 31, 84, 91, 100, 122, 147, 154, 166, 246
  Extract of 122
  Increased consumption of . 183
Orange marmalade . . . 21
Oxide of antimony . . . 238
  Zinc 155

Pale ale 205
Patent isinglass . . 148, 222, 243
  Medicines 172
Pennyroyal, oil of . . . 239
Pepper . 3, 6, 10, 81, 178, 209
Peppermint, oil of . . . 239
Peroxide of iron 123
Pharmaceutical Society . . 128
Pickles 3, 15, 125
Pimento 3, 17
Pineapple rum 77
Poor Law Boards, contracts by, for medicines . . 101, 122, 170
Porter and stout 3, 5, 27, 71, 104, 158, 162, 182, 195, 214, 244
Potash, carbonate of . . . 122
  Nitrate of 84
  Sulphate of 238
Potassium, cyanide of . . 129, 235
  Iodine of 240
Potted meats and fish . . 3, 20
Precipitated sulphur . 135, 155, 248
Prejudice in favour of certain adulterations . . . 126, 191
Preserves 3, 21
Prevention of adulteration, suggestions for the 37, 44, 74, 84, 86, 90, 123, 168, 179, 175, 193, 225, 252, 258
Prussian laws against adulteration 47, 180
Prussic acid 91
Publicans' adulterators . . 159
Purification of water by charcoal . 82

Quinine 55, 84, 236
  Sulphate of 247

PAGE
Raspberry jam 21
  Jelly 6
Red precipitate 238
  Sauces . . . 21, 42, 126
Revenue, injury to the, from adulteration . . 39, 74, 173
Rhubarb 53, 122
Rosemary, oil of 239
  Spirits of 240
Rum 3

Sal volatile 240
Sanitary consequences of adulteration 34
Sarsaparilla . . . 144, 250
  Extract of 250
Sassafras, oil of 239
Sauces 3, 6, 20
Sausages 112, 187
Scammony 4, 33, 122, 151, 165, 237, 247
  Tar 101
Semolina 109
Senna 150, 239
Sesqui-chloride of iron . . 123
Ship biscuits 244
Snuff . 3, 6, 17, 24, 209, 245
Soap 196, 205
  Sulphated 205, 216
Soda, carbonate of 83, 131, 136, 257
  Bi-carbonate of 136, 163, 169, 257
Soluble cayenne 255
Soy 20, 127
Sperm oil 187
Spices, mixed 3, 17
  Substitution of inferior, since the new tariff 176
Spirits of ammonia 240
  Nitre 238, 240
  Nitric ether 123
  Rosemary 240
Spurious scented snuffs . . . 209
  Tea 13, 50, 206
Stout 3, 27
Sugar 3, 6, 8, 111
Suggestions for improving Thames water 120
  For improving the purity of the Thames 116
  For the prevention of adulteration, 37, 44, 74, 84, 86, 90, 123, 168, 179, 185, 193, 225, 252, 258

PAGE
Sulphated soap 205, 216
Sulphate of potash 238
  Quinine 247
Sulphur, milk of . 135, 155, 237, 248
  Precipitated . . . 135, 155, 248
Sweetmeats and comfits . . . 111

Tamarinds 236
Tartar, cream of 239
  Emetic . . . . . . ib.
Tartaric acid . . . . . ib.
Tea, 3, 6, 12, 48, 60, 107, 110, 195, 206, 232, 244
  Adulteration of, by the Chinese, 13, 207
  Spurious . . . 13, 50, 206
Thames, suggestions for improving the purity of the . . . 116
  Water, impure condition of, 44, 83, 113
  Microscopic examination of . 43
  Suggestions for the purification of 120
Tinctures, frauds in the preparation of 143
Tincture of sesqui-chloride of iron, 123
Tobacco . 4, 6, 22, 195, 208, 210, 216
Tomato sauce 20
Turkish aroma 210
Turkey rhubarb 53

Unfermented bread 63
United States, inspection of drugs in the . . . 47, 167, 180
  Adulteration of milk in the 186

Valerianates 148
Vinegar . . 4, 6, 14, 204, 244
Vitriol, oil of 256
Volatile salts 240

Water, influence of bad, in spreading cholera . 45, 80, 119
  From London wells . . . 119
  Supply of the Metropolis 45, 81, 113, 117
White lead 83, 248
  Precipitate of mercury . 121, 237

Zinc, carbonate of 153
  Oxide of 155

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